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VETERINARY MEDICINE

SEPTEMBER 1939

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VOL. XXXIV
No. 9

Entered as second-class matter Nov. 8, 1920, at the post office at Chicago, Ill., under the Act of March 3, 1879.

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New Books for Veterinarians

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Veterinary Magazine Corporation

7632 S. CRANDON AVE. **CHICAGO, ILLINOIS**

VETERINARY MEDICINE

Registered in U. S. Patent Office

VOL. XXXIV SEPTEMBER, 1939 No. 9

Published Monthly by the

VETERINARY MAGAZINE CORPORATION

7632 S. CRANDON AVE., CHICAGO, ILL., U. S. A.

$4.00 a year; per copy 50 cents; Special Issues $1.00

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The average daily retail meat sales in this country total 50 million pounds.

* * * *

Glycogen present in muscle tissue at the death of an animal instantly starts to break down into glucose and lactic acid. Accumulation of lactic acid in the tissues causes rigor mortis. Autolysis due to enzymes in the tissues softens and prepares the way for bacteria which lead to putrefaction and total destruction of the flesh as such. The first three changes do not lessen the food value of the flesh.

* * * *

The increase in swine production in the United States in 1939 over the production of 1938 is greater than that of any other year on record, according to the Bureau of Economics of the U. S. Department of Agriculture, and hog supplies for the remainder of 1939 and the first half of 1940 will be more nearly normal than at any time in the past five years. The spring pig crop is estimated at 52,314,000, or the third largest since 1923. It is expected the fall pig crop will total 30 million. This aggregate of 83 million is 12 million, or 17%, greater than the 1938 pig crop. It is estimated that 8½ million sows farrowed in the spring of 1939, and that five million will farrow in the fall of the year.

More than nine million sheep and 1,605,000 cattle were licensed to graze on public lands during 1938.

* * * *

In 1938 the average price of farm machinery was 58% above the prewar level; the average price of farm products 5% below the prewar level.

* * * *

When farrowing sows are vicious and refuse their pigs or threaten them, give them a hypodermic injection of 15 to 20cc of pituitrin. It usually makes them docile, loving mothers.—*L. D. Mersch.*

* * * *

In the animal world, where intellectual pursuits do not enter, health and efficiency are virtually inseparable. The purpose of domestication of live stock is to subordinate them and their products to the needs of man, and so, when we direct our energies to securing the health of animals as an end in itself, we are serving humanity. There is the narrow field of prevention of the transmission of infectious animal disease to man and the wider field of maintaining that degree of animal health which will permit the continuance of productivity at a high level. In these, all practicing veterinary surgeons are engaged.—*Ed't'l in The Vet. Rec.*

Since 1900 the death rate in the United States from all communicable diseases has dropped by 70%, from 383 to 116 per 100,000 population. The general death rate from all causes has gone down 34%. If the death rate of 1900 had prevailed last year there would have been 817,745 added deaths in the nation.—*Thomas Parran.*

Mosaic law commands circumcision, but forbids the operation before the baby is eight days old. Recent research has shown that babies are born with an adequate quantity of prothrombin in the blood to prevent serious hemorrhage from trifling causes, but from the second to the seventh day of age they suffer a marked prothrombin slump which renders hazardous any hemorrhage. Injections of vitamin K tides babies over this danger period efficiently.

Smallpox in the United States

A writer in *Public Health Reports* asks why and where smallpox occurs and answers his own question. The United States led all nations of the world except India in the number of cases of smallpox in 1937. In 1939, 15,000 cases occurred in the United States. England and Wales, with one-third our population, had 12 cases; France with a similar population had 273 cases; and Germany, with one-half our population, had no cases in 1936.

The high incidence of smallpox in the United States occurs among a small percentage of the population. Thus New Jersey, with a population of 4,400,000, has had no case in more than seven years. In the same period there have been more than 12,000 cases in North Dakota, South Dakota, Montana, Idaho, Oregon, Wyoming and Utah, although the combined population of these seven states is less than that of New Jersey.

The answer to why smallpox occurs is "failure to vaccinate." The answer to where smallpox occurs is, "where the population is not vaccinated."

No other disease of mankind is so easily controlled as is smallpox. With a proper regard for vaccination, smallpox can be eliminated from any country.

Three of today's 76 medical schools were founded more than 150 years ago: the Medical College of Philadelphia, today a part of the University of Pennsylvania, was founded in 1765; The King's Medical Department, today's Columbia College, was founded in 1768, and Harvard had its first medical school in 1782.—*Phar. Adv.*

The death rate in children under one year of age is 54.4 per 1000 live births in the United States. The rate is less than 45 in 11 states: New Jersey (39.4), Washington (39.9), New Hampshire (40.2), Minnesota (40.8), Utah (41.4), Oregon (41.5), Nebraska (42.1), Illinois (43.1), Wisconsin (43.4), Idaho (43.7) and Massachusetts (44.1). The rate is greater than 65 in nine states: Maine (65.3), North Carolina (65.5), Louisiana (65.6), Virginia (69.7), Colorado (73.5), South Carolina (73.6), Texas (73.9), Arizona (120.7) and New Mexico (123.7).

As the chemical constituents of vitamins are discovered the tendency of biochemists is to drop the letter designation and adopt the chemical name for the product. Thus if one would be up-to-date one says not vitamin C, but ascorbic acid; not vitamin B_1, but thiamin; not B_2 or G, but nicotinic acid. Vitamin E becomes alpha tocopherol.

Laughs On the Cocksure

London laughed at Stevenson's proposal to haul omnibusses by steam, Philadelphia smiled over Franklin's notion of using lightning for industrial purposes, the world snickered when they saw the first horseless carriages plodding through the streets and the Wright brothers were considered "crackbrained" for attempting to imitate the birds in their flight. Thomas Jefferson was ridiculed when he declared his belief that the then howling wilderness west of the Mississippi would some day amount to something. Seward's folly is now Alaska. Wiseacres foretold the impracticability of the Panama Canal on account of yellow fever. Jenner was ridiculed in the press for vaccination and Lister's ideas of antisepsis were derided by other surgeons.—*Pharmacal Advance.*

New Film Strip on Tuberculosis Available

"Eradicating Tuberculosis from Live Stock and Poultry" is the title of a new film strip just released by the U. S. Department of Agriculture. It illustrates some of the ways in which tuberculosis may attack live stock, and practical methods for its prevention. Tuberculin testing, sanitation, and the use of disinfectants in fighting the disease are emphasized.

The film was prepared coöperatively by the Bureau of Animal Industry and the Extension Service. Information regarding this and other film strips of the Department may be obtained from the Extension Service, U. S. Department of Agriculture, Washington, D. C.

* * * *

Progress in Bang's Disease Control

May 1, 1939, the U. S. Department of Agriculture issued a map showing the percentage of breeding cattle under supervision in the Bang's disease eradication project undertaken coöperatively by the department and the various states July 1, 1934. In the whole country 10,896,719 animals, representing 20.5% of all breeding cattle, were under supervision on that date. The number under supervision in different states varied widely, ranging from 0.04% to 92.1%.

The states having more than 50% of the number of cattle in them under supervision were: Virginia (92.1% and 595,632 animals), Oregon (89.8% and 668,373), Washington (82.2% and 507,326), Arkansas (72.2% and 625,294), West Virginia (55.6% and 240,916), Utah (54.2% and 182,626), and Delaware (54.1% and 25,405.)

The five states ranking highest in the number of cattle under supervision were: Wisconsin (35.5% and 1,054,287 animals), Minnesota (26.9% and 729,841), Oregon, Missouri (33.5% and 652,374) and Arkansas.

The states having less than 4% of their breeding cattle under supervision were: California (0.04% and 712 animals), Texas (0.9% and 49,733), Colorado (2.0% and 22,140), Vermont (2.2% and 8,831), Massachusetts (2.7% and 4,885), South Dakota (2.7% and 33,900) and Nebraska (3.3% and 80,032).

The states having fewer than 10,000 animals under supervision were: California, Rhode Island (13.3% and 3,585 animals), Massachusetts, Connecticut (4.4% and 7,414) and Vermont.

* * * *

Treatment for Screw Worms

An effective and economical way to protect livestock from screw worms has been developed by the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture. The treatment consists of applying finely ground diphenylamine — a crystalline chemical long used in the dye industry—to any break in the skin of cattle, sheep, horses, or hogs that may be exposed to screw worm flies that lay the eggs from which the destructive worms hatch.

Diphenylamine poisons young screw worms hatching out in wounds on animals. Enough of this powdered chemical to kill any worms that may hatch for several days will stick to the animal tissues. Applications should be made every three days until all injuries have entirely healed.

Diphenylamine will not kill large screw worms. Benzol still is prescribed for the first treatment of wounds that have become infested. Once the large worms have been killed by benzol, however, applications of diphenylamine every three days will prevent the development of others.

Diphenylamine has the advantage of being nonpoisonous to animals, as well as easy to apply and low in cost. It may be obtained from Du Pont or the Dow chemical companies, from Eastman Kodak Co. and from Lederle Laboratories, 30 Rockefeller Plaza, New York.

Diphenylamine requires to be finely powdered for use on wounds. It is usually received from the manufacturer in coarse crystals, necessitating further grinding with a mortar and pestle by the user.

The screw worm each year kills livestock worth several million dollars in the South and Southwest.

Vaccination and Disease Control

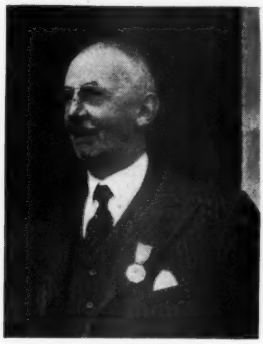
The control of infectious disease requires preventing virulent organisms from reaching susceptible individuals. In the case of organisms that are short-lived outside of the living animal this leads to prompt eradication. Where a reasonably effective vaccine is available it is usually more economical and practical to increase the resistance of the host than to destroy or remove the parasite. It is not necessary that the vaccine be 100% effective or that every individual be vaccinated. A disadvantage of vaccination, other than falling short of 100% efficiency, which should not be expected of any remedial agent, is the tendency to rely upon it exclusively where it is used and neglect other valuable measures in the war against disease. The usual method of combating outbreaks of hog cholera is an example of this use of vaccination to the exclusion, in most instances, of other measures that might usefully supplement it. The failure of the serum-virus vaccination against hog cholera to reduce the loss occasioned by this disease during the past 30 years is in no sense due to a failure of the vaccine, but to a misuse of it.

Any outbreak of smallpox in man can be brought under control quickly and the disease completely eradicated from the community, state or nation by vaccination, and yet up to about 12% of vaccinated persons are susceptible to smallpox. The final outcome is hastened but not altered by strict quarantine and good sanitation. A large majority of immune persons in a community constitutes a barrier to the spread of the virus that it is unable to hurdle. If even as few as 20% of the children in a community are immune to diphtheria, no widespread outbreak of the disease will occur. Farmers who vaccinate their horses against encephalomyelitis protect not only their own but in lesser degree their neighbors' animals also. Disease organisms differ in their ability to survive among a low percentage of susceptible hosts, but based upon the apparent low contagiousness of equine encephalomyelitis it seems unlikely that an outbreak will occur in any community of the size of a county where 50% of the animals have been vaccinated. In a preseason vaccination campaign in the western provinces of Canada, 50% of the horses were vaccinated for the prevention of encephalomyelitis in the belief that this proportion of immunes will prevent any widespread outbreak of the disease. In Shelby and Madison and perhaps other counties in Illinois it is thought that considerably more than half of the horses were vaccinated in the pre-season campaign fostered by the Farm Bureau. However, until more experience is had estimates of the proportion of vaccinated animals necessary to prevent outbreaks of this disease can be little more than guesses.

A highly infectious disease like foot-and-mouth disease can exist where there are but few susceptibles; rabies, on the other hand, is easily barred by a lack of available susceptible animals and is often brought under control simply by removal of the strays in the community; the opportunities for biting cared-for dogs being scarcely sufficient in number to perpetuate the disease. Since not every dog bitten by a rabid animal succumbs to the disease it is necessary for each rabid dog to bite, let us say for example, three other dogs, or that the average biting by all the rabid dogs must be three. If there be no stray dogs in the community, or only a few, the opportunity for this amount of biting may not exist and the disease will slowly die out in that community. Interposing vaccinated, non-susceptible dogs would have the same effect. Confining dogs that have been bitten breaks the chain of communication in like manner.

Rabies is an exception in disease control. The owners of other animals desire them freed from disease and willingly submit to some measure of restriction and the incurrence of some inconvenience and expense to protect them from disease. A large proportion of the owners of dogs, on the other hand, resent any restriction of themselves or their animals for the purpose of even

suppressing an active outbreak of this disease and mention of measures for its eradication from the whole country sends their blood pressure skyrocketing. This attitude must be taken into consideration in any attempt to control or eradicate rabies. It makes necessary the employment of all effective measures in its control. Quarantine, confinement to the owner's premises, effective muzzling, restraint on the leash and vaccinating are all useful. Some dog owners will willingly comply with one of these measures, some with another, and all together the number effectively preventing the spread of rabies to or from their animals is usually sufficient for rather prompt control of the disease. Where only a part of these restrictive measures are employed, as in the outbreak in Minneapolis two years ago, cases of the disease usually continue to occur for many months.



Prof. G. H. Wooldridge

It is often stated that perfect sanitation will eradicate any disease. If we omit from consideration such disease as anthrax, blackleg and others the causative organisms of which live indefinitely outside of the animal body, the accuracy of the statement probably turns upon the definition of "perfect sanitation." In any case it is unimportant since perfect sanitation is generally impossible of achievement with the means at hand or impractical because of the cost. Reasonably good sanitation is the aim for which to strive. Reasonably good sanitation is extremely important in the control of some diseases, wholly useless in the control of others. Brucellosis in cattle is an example of the former; tuberculosis in adult birds is an example of the latter.

New President of the R. C. V. S.

Professor Geo. H. Wooldridge, F.R.C.V.S., Vice-Principal and Professor of Medicine at the Royal Veterinary College, London, was elected president of the Royal College of Veterinary Surgeons at the recent annual meeting of the council of that body. For readers who confuse the R.C.V.S. and the Royal Veterinary College it is repeated that the former is not a teaching college but the licensing and governing council of the veterinary profession in Great Britain.

Professor Wooldridge is well known in America. He attended the 12th International Veterinary Congress in New York in 1924 and visited Ithaca, N. Y., Chicago, Detroit, Toronto, Guelph, Ont., Montreal and Boston afterward. In addition most of the American veterinarians who have attended the last four veterinary congresses in Europe have met him and some of them have been entertained in his home. All will feel certain that no better choice for the official head of the profession in Great Britain could possibly have been made.

Over a long period Professor Wooldridge has been a frequent contributor to periodical literature. He has written or contributed to several textbooks on cattle pathology, but his magnum opus in a literary way is an "Encyclopædia of Veterinary Medicine, Surgery and Obstetrics." He was joint editor of the Veterinary Journal from 1906 to 1914.

Professor Wooldridge has been on the faculty of the Royal Veterinary College since 1908. He typifies the American conception of an English professor, which is saying a good deal for his dignity and conservatism, yet is so human that he is affectionately known among students, faculty, former students and British veterinarians generally as "Uncle George."

Professor Wooldridge has taken an active part in the professional and social activities of the National Veterinary Medical Association of Great Britain and Ireland and affiliated societies. He was president of the Central Veterinary Society in 1913-14, 1917-19, and president of the Royal Counties Veterinary Medical Society in 1924 and 1925.

The Most Noted Horse in Turf History

The race of Thoroughbreds was founded by three Arabian stallions imported into England near the beginning of the 18th century: Byerley Turk, imported about 1686; Darley Arabian, imported in 1706, and Godolphin Arabian, a few years later. All the more than 100,000 thoroughbred horses alive today trace their ancestry to three noted descendants of these stallions. These latter famous patriarchs are: Matchem (foaled in 1748), grandson of Godolphin Arabian; Herod (foaled in 1758), great-great-grandson of Byerley Turk; and Eclipse (foaled in 1764), great-great-grandson of Darley Arabian. Eclipse became the most noted horse in turf history. He died in February 1789, and was dissected by Charles Vial, founder of the London Veterinary College, the first veterinary college established in any English speaking country. Vial wrote a monograph describing the skeleton of Eclipse and giving the proportion and length of the bones. The skeleton is said to have been without a blemish except from laminitis.

Eclipse is thus of particular interest to veterinarians. He was never beaten in a race. Within a few years his owners could find no takers for bets on him, except as to how far he would outdistance the other horses in the race. In this way he was usually handicapped about 60 yards in the mile. At the autopsy his heart is said to have weighed 14 pounds—somewhere near twice the normal weight in such a horse.

To this day some are prone to claim special merit for certain families or strains of thoroughbreds because of the amount of Eclipse blood they carry in their veins. Such claims are based on fallacy; all registered thoroughbred horses derive from Eclipse in approximately the same degree, just as all carry the same amount of Herod blood in their veins, and of Matchem also. In a period of 10 or 12 generations the blood of an ancestor is diffused widely and diluted thinly. Thus in the 12th generation alone a foal has 4,096 ancestors, and in a homogenous group like the thoroughbred horse the group of ancestors for one foal differs but microscopically, if at all, from that of another, beyond the tenth generation. Ancestors that can materially affect the animal are found probably in no case further removed than the fifth generation, which gives it an ancestor for each chromosome with several to spare.

* * * *

Cattle Mange History

In a recent number of VETERINARY MEDICINE the statement is made that cattle mange (scabies) has been known in this country for many years.

I think it was in the winter or spring of 1895 that I was called to investigate a skin disease in a herd of cattle on the old Fort Larned military reservation. This old military post was located where the Santa Fe trail forded the Pawnee river, a few miles west of the present city of Larned, Kansas. The post had been abandoned by the government and the soldiers' bodies had been removed from the post cemetery, but there were many civilians buried there and the headstones had been broken down by cattle rubbing them.

The post buildings were of stone arranged in the form of a quadrangle. The ranch boss lived in what had been the commanding officer's quarters and the barracks were used as sheds for stock.

The disease was diagnosed as psoroptic mange and a description of the disease and the causative mite, was published in a bulletin of the Kansas Experiment Station. This I think was the first published description of this disease in the United States.

Cattle mange had been known by cattlemen before this, and in southwestern Kansas was called "Texas itch" and in Texas I was told it was called "Mexican itch."

Cattle mange spread quite rapidly in western Kansas. I was absent from the state from 1897 to 1901. In the latter year the disease was widely distributed over the western third of the state.

N. S. MAYO.

Highland Park, Ill.

Agricultural Editor Interviews Merillat

Had a fine visit last week with an old friend, Dr. L. A. Merillat, Executive Secretary of the American Veterinary Medical Association. He stopped in to make a talk on Prairie Farmer's Dinnerbell Program, which you may have heard.

After 50 years of service in the veterinary field, Dr. Merillat looks back over the period of real recognition for that profession, and looks ahead to a greater future. While the veterinarian started out as a "horse doctor," the horizon of his work has widened until he is today a vital factor in any public health campaign. We talked of the eradication of tuberculosis in cattle, a task so great that foreign experts with more experience laughed at the idea of eradicating it. But they had not figured on the American spirit, and today they give credit to this country for an amazing victory.

The veterinarian's place in public health is best demonstrated by the decrease in the infant forms of tuberculosis since infection is no longer borne in cow's milk. Still a problem, but as surely scheduled for eventual victory, is Bang's disease, which in the human family is the cause of undulant fever. Tularemia, rabbit fever, still has some tricks not wholly discovered, for sheep herders working with their flocks in the west have acquired it, apparently from their sheep. Sleeping sickness offers another example of the close relation between animal disease control and public health.

■ Dr. Merillat made some interesting remarks about dogs. There is a marked movement, he says, toward the keeping of better dogs on farms. The farmer who has pedigreed cattle, hogs, chickens, corn, and almost everything else, is no longer satisfied to have a mongrel dog. There are some dog problems yet to be solved.

In England, he said, there is no rabies problem, because of a rigid policy of quarantine and isolation carried on for many years. Following the World War there was a little flurry of rabies cases, but the disease is again so well under control that it practically does not exist for them. If you want to take a dog into England, it must stay in quarantine for six months. Rabies is still a problem in America, not only for dogs, but far greater, for human beings.

The efforts of such fine men as Dr. Merillat and the 5,500 members of his association make us want to back them up, and at the same time help to smash the shysters and quacks who are only dollar grabbers, with no vision of the big job of service to be done.—*Editorial in The Prairie Farmer*, June 17, 1939.

* * * *

For control of rabies, quarantine imported dogs, restrain dogs in an infected community and use prophylactic immunization against rabies as an adjunct, not a substitute, to these measures.—*R. A. Kelser.*

* * * *

The results of researches as they have accumulated from year to year indicate a quantitative relationship between normal physiological function and vitamin intake. Deprivation of any one of the vitamins results in the development of symptoms specific for that vitamin. Low vitamin intake may result in subacute or chronic manifestations not easily recognized as due to vitamin deficiency.—*U. S. Dept. of Agriculture.*

* * * *

Horses Eat

In 1915, it required 96 million acres of farm crops to feed the horses and mules in the United States. In 1936, only 54 million acres were required. Similarly, pasture requirements dropped from 90 million acres in 1915 to 55 million acres in 1936.

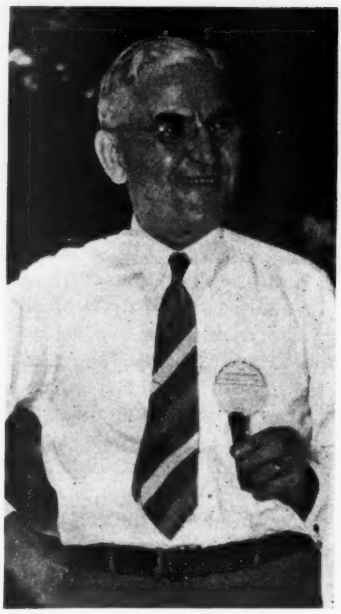
The acreage planted to corn this season is expected to be the smallest in 40 years, and acreage devoted to oats the smallest in 30 years. The oats acreage will be pulled down below expectations on account of the failure of some seedlings. On the other hand, if it is a good growing season the hay crop may easily be the largest on record; the soy bean crop certainly will be, and the production of barley and grain sorghums will be large. The only way out for the farmer is the production of more live stock. —*Vitamineral News.*

NUTRITIONAL CONFERENCE FOR VETERINARIANS

Above: In small groups the veterinarians were taken through the Central Soya Company's plant. Here a group is shown in the control laboratory. Left: A number of pigs that had been fed for 90 days on a ration containing somewhat more than double the optimum percentage of protein were slaughtered to demonstrate the lesions produced. Dr. A. F. Schalk, Columbus, O. (holding a cane) had charge of the necropsies. Below: The veterinarians hear Dr. Robt. Graham, Urbana, Ill., discuss listerellosis.

Second Nutrition Conference for Veterinarians

Last summer the Central Soya Company, Ft. Wayne, Ind., processors of soy beans and a subsidiary of the McMillen feed company, invited all veterinarians in Indiana, Michigan and Ohio to a one-day conference on animal nutrition. Two hundred responded to the invitation. This year the conference was repeated and the invitations extended to include also Illinois and Pennsylvania veterinarians. Four hundred attended this second conference, which was held July 12 at Decatur, Ind., where the Central Soya plant is located, and at Ft. Wayne, where are the headquarters offices of the McMillen company.



Mr. D. W. McMillen, Founder of the Central Soya Company

The program was furnished chiefly by members of the experiment station staffs of Indiana, Ohio, Illinois and Michigan, as follows:

Address of Welcome, Roy Hall, president Central Soya Co., Inc.; Death Losses of Newborn Pigs, L. P. Doyle, Lafayette, Ind.; The Diagnosis, Treatment and Prevention of Acetonemia, Jesse Sampson, Urbana, Ill.; The Importance of Laboratory Diagnosis in Poultry Diseases, W. S. Gochenour Jr., Pitman-Moore Laboratories; Poultry Disease Schools for Veterinarians, E. S. Weisner, East Lansing, Mich.; Soy Bean Oil Meal—Up-to-Date, R. M. Bethke, Columbus, O.; The Effect of Feeds on the Quality of Meats, H. J. Gramlich, Secretary, American Shorthorn Breeders' Association; The Three of Us, Paul Gerlaugh, Columbus, O.; Listerellosis in Cattle and Sheep, Robert Graham, Urbana, Ill.; Ethical Advertising for Veterinarians, Glenn H. Campbell, Campbell-Sanford Advertising Co., Cleveland, O.; Clinical Demonstration—High Protein Rations for Pigs, W. L. Robison, and A. F. Schalk, Columbus, O.

Mr. Lyman Peck, Director of Nutrition for the Central Soya Company, was chairman of the conference. Mr. D. W. McMillen presided at the banquet, at which Dr. G. I. Christie, president of the Ontario Agricultural College, was the principal speaker. Doctor Christie lauded the Central Soya Company for its enterprise in sponsoring the meeting, terming it one of the most constructive steps toward a new era in agriculture. He pointed out that nutrition, a comparatively new phase of agricultural research, has provided answers to many hitherto baffling disease problems, and suggested that veterinarians avail themselves of scientific assistance from experiment stations and agricultural schools in order to keep abreast of developments in this field. Doctor Christie closed his address with a plea to the veterinarians to assist farmers in planning for the future.

The program included a tour of the Central Soya Company's plant, where the veterinarians were shown the processes used in producing soy bean oil meal.

The conference was a great success, as may be surmised from the large attendance and the list of speakers. Such conferences are a recognition of the important part nutrition is coming to play in the health of animals and the important function of the veterinarian in any program having the objective of improving the feeding of farm animals. Mr. Peck and the Central Soya Company are to be complimented upon their foresightedness in this matter.

Memphis Meeting of the A. V. M. A.

VETERINARIANS from all over the United States have written "Memphis —A. V. M. A. Convention" on their calendars for the week of August 28-September 1. They will come by automobile, by train, and a few will fly to the 76th annual meeting of this the largest organization of veterinarians in the world.

The Committee on Local Arrangements, headed by John H. Gillmann, has completed plans for the meeting. The literary and clinical programs were detailed in this magazine last month. In addition, a program of entertainment has been planned for attending veterinarians and their wives.

■ For those coming on the A. V. M. A. Special from the east, and for others who wish to join this group at Knoxville, a one-day motor tour of the Great Smoky Mountains National Park, the largest, most beautiful and most popular national park in the East, has been arranged for August 28. The park comprises nearly 500,000 acres of rugged wilderness about equally divided in area between North Carolina and Tennessee. Included in the itinerary are Newfound Gap, Clingman's Dome, Skyland Drive, Nantahala Gorge, and other points of great scenic beauty; the Cherokee Indian Reservation, and Maryville, the seat of Maryville College. Those taking the tour will leave the train at Knoxville at 7:30 a. m., returning at 7:55 p. m after a complete circuit of the park, and arriving in Memphis August 29 at 7:20 a. m. The price of the "Smokies" detour is $13.50, including transportation, meals, and tips.

The entertainment committee, of which E. S. Brashier is chairman, has planned as one feature of the convention a half-day outing and barbecue on the Wilson plantation in Wilson, Arkansas—across the Mississippi from Memphis—with native negro singers furnishing the entertainment. Other events on the program include the President's ball, the annual banquet, and tours of the city. Many alumni banquets have been planned for the convention also; Andy Crawford is making arrangements for these.

■ For the ladies there will be a style show, luncheons in the Hotel Peabody ballroom and at the Nineteenth Century Club, and shopping tours, in addition to participation in the social events on the men's program. Mrs. John H. Gillman, as acting chairman of the women's arrangements committee, has been active in planning the ladies' entertainment.

■ The educational exhibits will include: Bureau of Animal Industry pathological and zoölogical exhibit, prepared by W. W. Lawson and W. A. Cornell; Bureau of Animal Industry pathological exhibit, prepared by J. S. Bengston; Iowa State College, exhibit of 26 plans for small animal hospitals, prepared by senior students; Alabama Polytechnic Institute, College of Veterinary Medicine, pathological exhibit, prepared by I. S. McAdory and L. E. Starr; Kansas State College, Division of Veterinary Medicine, photographic exhibit prepared by R. R. Dykstra; University of Minnesota Medical School, Department of Bacteriology and Immunology, exhibit of viruses and inclusion bodies, prepared by R. G. Green, M. D.; Bureau of Animal Industry, (Memphis office) exhibit of fresh pathological specimens, and of inspected products, prepared by G. E. Mitchell, Inspector in Charge; Memphis Health Department, exhibit of a model dairy barn and dairy equipment, prepared by L. M. Graves, M.D., and Mr. A. H. Fletcher; Winthrop Chemical Company, Inc., exhibit of sound film, "Reproductive Disorders in Horses and Cattle," prepared by Prof. R. Götze.

■ Several A. V. M. A. members have been asked to speak before the various civic clubs of Memphis during the Convention. These include H. M. O'Rear, M. Jacobs, D. M. Campbell, E. J. Frick, and L. E. Starr.

Practical Urine Analysis

Examination of urine for pathological constituents requires no expensive apparatus, nor any special skill in conducting the analysis. The few tests that are necessary for a routine analysis should not require more than 20 to 30 minutes and may be completed in even less time after some practice. In certain instances, it may be necessary to use but a single test; e.g., a test for ketone bodies in suspected cases of ketosis in cows (acetonemia) and ewes (pregnancy disease).

It is important to remember that the results of the examination must always be correlated with the history and with the clinical symptoms of each case.

Fresh voided urine should be used whenever possible. If this is not convenient, the specimen should be kept in the refrigerator. A small amount of toluene added to the sample acts as a suitable preservative. For best results, it is desirable that the analysis be made on filtered urine, although either filtered or unfiltered urine may be used for the ketone test.

The following tests have been found satisfactory and adequate for a routine analysis of urine specimens submitted to the Laboratory of Animal Pathology and Hygiene.

Litmus Paper Test for Reaction

Materials.—Red and blue litmus paper.

Procedure.—Dip one end of the paper into the urine and note whether there is any change of color. The paper selected will usually depend upon the species of animal from which the urine was collected; viz., blue for dog, cat, and pig; red for horse, cow, and sheep. Alkaline urine turns red litmus blue; acid urine turns blue litmus red.

Remarks.—If the urine is not fresh, little or no significance can be attached to the result. Even when the urine is fresh, it is questionable whether this test has any real value.

Some interpretations.—Acid urine from a pregnant or lactating cow may be suggestive of acetonemia. Acid urine from a pregnant ewe may be suggestive of pregnancy disease. Alkaline urine from a dog may be suggestive of cystitis.

Fish's Picro-Aceto-Glycerol Test for Albumin

Reagent.—Picric acid, 10gm; glacial acetic acid, 10cc; glycerol, 250cc; water, 1000cc. Dissolve the picric acid in hot water and add the other ingredients. (Distilled water should be used in preparing reagents.)

Procedure.—Introduce about 5cc of the reagent into a test tube. Hold the tube in the left hand at an angle of 45° and then add gently, by means of a medicine dropper, the end of which is held against the side of the tube, approximately 5cc of clear urine. Carefully return the tube to a perpendicular position and observe whether a yellowish-white ring appears at the zone of contact between the reagent and the urine. The thickness of the ring is a rough measure of the quantity of albumin present in the specimen.

Remarks.—This is a sensitive test for albumin. It has been found applicable for

any of our common species of animals. The test for albumin is extremely useful but the significance of a positive result must not be arrived at too hastily. Whenever possible, a positive reaction should be followed by a microscopical examination of the sediment in the urine. The sediment may be obtained by allowing a portion of the urine to stand for several hours and then pouring off the top urine or, more expeditiously, by centrifuging 10 to 15cc of the well-mixed sample. The microscopical examination may reveal the presence of casts. The casts come from the tubules of the kidney and these, together with a positive test for albumin, are indicative of nephritis. A positive test for albumin, whether or not accompanied by a microscopical examination, should not be considered without some possible significance. Tests on separate specimens of urine over a period of days or weeks will show whether the albuminuria is mild and transitory or decidedly pathological and permanent in nature. If of the latter type, it is usually safe to assume that the kidneys, as well as other parts of the urogenital system, are involved.

Some interpretations.—Albuminuria in the cow may suggest pyelonephritis or cystitis. In the ram, albuminuria may suggest cystitis and inflammation of the urethra due to calculi. Positive tests may suggest nephritis and inflammation of other parts of the urogenital system in dogs.

Benedict's Test for Sugar

Reagent.—Copper sulphate, 17.3gm; sodium citrate, 173gm; sodium carbonate (C. P. anhydrous), 100gm; water, to 1000cc. Dissolve the copper sulphate in 100cc of hot water, cool, and dilute to about 150cc. Dissolve the 173gm of sodium citrate and 100gm of sodium carbonate in 600cc of water with the aid of heat. Cool and dilute to approximately 850cc. When the solutions are cool, add the copper sulphate to the combined sodium citrate-sodium carbonate solution. Stir continually while making the addition and do not add the copper sulphate solution rapidly. Make up one liter.

Procedure.—Introduce 5cc of the reagent into a test tube and heat to boiling. The solution should remain a clear blue color. Now add eight to ten drops of the urine and boil vigorously for two minutes over a free flame or from two to three minutes in boiling water. A piece of paper folded into a narrow band serves as a satisfactory test tube holder. The test may be considered positive if a green- or orange-colored precipitate forms in the solution. A slight turbidity has little significance.

Remarks.—Benedict's reagent is stable and a positive result is seldom misleading unless the test is conducted on urine that has been voided during the latter stages of pregnancy and the early part of lactation. A positive test during these periods may be due to lactose. Confirmatory tests for glucose may be used but are not often necessary. Furthermore, the significance of a positive test must be determined by an examination of several specimens.

Some interpretations.—At the present time, the chief usefulness of the test for sugar seems to be restricted to the detection of diabetes in dogs. A heavy precipitate should suggest the possibility of this disease. A positive test for sugar coupled with a highly positive test for ketone bodies is strong evidence that the animal is affected with diabetes. So-called feedlot hyperglycemia in lambs is characterized by a tremendous increase in the blood sugar and the elimination of large quantities of sugar in the urine. This disease is usually fatal. Lambs and mature sheep may die from what appears to be an acute form of indigestion due to over-feeding on concentrates, especially shelled corn, without the elimination of sugar in the urine.

Hay's Test for Bile Salts

Reagent.—Finely powdered sulphur (flowers of sulphur).

Procedure.—The sulphur is sprinkled on the surface of a small quantity of urine. If the specimen contains pathological amounts of the bile salts, the sulphur sinks to the bottom rapidly. The sulphur remains on the surface of normal urine.

Application. — Pathological amounts of bile salts in the urine may be expected to

be associated with disorders that are characterized by jaundice.

Weber Benzidine Test for Hemoglobin

Reagent.—Ether, glacial acetic acid, saturated alcoholic solution of benzidine, 3% hydrogen peroxide. (Caution: Ether and alcohol must be kept away from fire.)

Procedure.—Add 1cc of glacial acetic acid and 10cc of ether to 10cc of urine. Shake well for several minutes and set aside. The ether extracts the pigment, hematin, from the hemoglobin and rises to the top. Pour off the layer of ether and to this now add 2cc of the benzidine solution followed by 2cc of the 3% hydrogen peroxide. If the urine contains hemoglobin, a greenish-blue color develops after the addition of hydrogen peroxide.

Remarks.—Occasionally red blood cells without free hemoglobin are present in the urine. The red cells are readily detected by the microscopical examination.

Some interpretations. — Hemoglobinuria in the dog may suggest calculi, cystitis, possibly nephritis or prostatitis. A positive test in the cow strongly suggests pyelonephritis, and in the ram, calculi. Since bloody urine may be the result of trauma or some less serious cause, it is often advisable to attempt to determine if the source of the blood is below the kidney. The use of the microscope in a careful study of the sediment is indicated.

Ross' Modification of Rothera's Nitroprusside Test for Ketone Bodies

Reagent. — Sodium nitroprusside, 1gm; ammonium sulphate, 100gm; ammonium hydroxide. Grind the sodium nitroprusside to a fine powder and mix with the powdered ammonium sulphate. Store in a brown bottle.

Procedure.—(It is not essential to use filtered urine for this test.) Put approximately 1gm of the sodium nitroprusside-ammonium sulphate mixture into a test tube. Add about 5cc of urine and shake until the solid mixture goes into solution. Now add 2cc of the ammonium hydroxide. A positive test is indicated by a deep purple color. The color is not permanent (10-20 minutes).

Remarks.—This is a very sensitive test for even small quantities of acetoacetic acid, one of three chemical substances known as the ketone bodies. Acetone, another member of the group, will also react to the test.

The ketone bodies are a closely related group of chemical substances that may be considered as intermediate products of fat metabolism. The ketone bodies are formed chiefly in the liver. These substances are toxic. Furthermore, two of the ketone bodies are acids and, therefore, rob the body of alkali. This may result in intense acidosis (lowered alkalinity).

Some interpretations.—Normal dog urine invariably gives a negative test for ketone bodies. A strong positive reaction, if accompanied by a positive test for sugar, is suggestive of diabetes. The result of this test may be considered almost pathognomonic of acetonemia and of pregnancy disease. A diagnosis of clinical and subclinical acetonemia in cows and pregnancy disease in ewes can be made quickly and accurately by this test. A slight positive reaction may or may not be significant. The result of the test should be interpreted in the light of other clinical findings.—*Animal Pathology Exchange,* Univ. of Ill.

Veterinary Service Essential in Settling Live-Stock Shippers' Claims*

By ARTHUR H. BRYAN, Baltimore, Maryland
Science Department, Baltimore City College

THE veterinarian is an invaluable professional arbiter in the more or less constant triangular controversy between the shipper, the carrier, and the consignee of live stock. The railroads and other transportation agencies assume responsibility for the safe transit of live stock, within certain defined legal limits, and are liable for injuries sustained by animals in transit, if due to their negligence, improper handling or, under some conditions, if they be due to delay. Should any animal become sick or injured, or die during transit, shippers may consider the railroad accountable for such losses. Animals may, however, have ben injured or exposed to infectious disease prior to shipment, and in such cases the transportation company is not liable. It is obviously to the best interest of all concerned to have in each case an impartial inspection by a veterinarian to determine, if possible, the origin of the illness or injury so that the liability may be properly placed.

■ The one person competent to solve such problems is, of course, the veterinarian, with the occasional coöperation of a bacteriological or pathological laboratory. With a single shipment of sick, diseased, or injured live stock, claims may involve possibly hundreds or even thousands of dollars; veterinary services are necessary to solve the controversial difficulties. Usually a veterinarian is called upon to examine the injured or sick live stock and render a descriptive, written report and diagnosis, giving observable symptoms and external visible lesions, if any. If the animals are dead or dying, the veterinarian makes a post-mortem examination and a report sufficiently comprehensive to indicate the probable cause of death.

Every condition should be indicated as acute or chronic, because chronic cases are not the responsibility of the railroad. In case of acute infectious diseases such as: hog cholera, hemorrhagic enteritis, equine influenza, hemorrhagic septicemia, black leg, broncho or lobar pneumonia, malignant edema, canine distemper, fowl cholera, pullorum disease of chicks, white scours, acute catarrhal mastitis of cattle, abscess formation, etc., the railroad is obviously not accountable if the shipment has been enroute less than the period required for these conditions to develop, which is almost invariably the case. In cases of tetanus, the period of incubation decides the accountability. Chronic diseases such as malnutrition, tuberculosis, coccidiosis, pulmonary strongylosis, distomiasis, rickets, etc., need only to be diagnosed by a veterinarian in order to free the railroad of responsibility.

The consignee often points out extensive bruising as a basis for his claim. But the bruising may have occurred as a result of trampling by the other animals in the car after the animal went down, and the primary inciting disease which floored the animal may have been infection such as shipping fever or pneumonia. The veterinarian is the only person in a position to determine this point, and in such cases as this the veterinarian's diagnostic ability will be greatly hampered if he is unable to examine the carcass until some decomposition has presented itself as differential diagnosis between disease and injury is very difficult after the animal has been dead for any considerable length of time.

■ Where large claims are likely to be involved laboratory diagnosis may be resorted to in addition to the regular inspection. In all cases of ante- and post-mortem inspection, the veterinarian on the case should

*This paper is based on ten years' experience by the writer in handling railroad and shipping claims of live stock.

welcome the presence of a fellow professional man representing other interested parties, as it is then possible to work out the highest degree of professional ability. In all cases a scientific diagnosis based upon professional integrity is the policy, with both veterinarians reaching a harmonious agreement. The veterinarian must not assume or permit himself to be maneuvered into the position of an advocate of either party to the controversy. That is the rôle of the attorney. The veterinarian is simply an expert on animal pathology employed by one or the other or both parties to supply the *facts*. It is not his business to plead the case of his employer; nor can he do so successfully, for the minute the jury detects a prejudiced note in his testimony his influence is largely gone. In other words, the veterinarian is called as a professional scientist and he can prostitute that rôle only at the peril of himself and his client.*

In all cases when diseased lungs or other parenchymatous tissues are sent to laboratories for bacteriological examination, the specimen should be labeled and shipped in the presence of witnesses. When large claims may be involved, or when court cases may be pending, histopathological examination also may be advisable, and a specimen of the diseased tissue should be taken for sectioning and shipped in 10% formalin.

The veterinarian himself may be in a position to make a simple bacteriological examination to substantiate the diagnosis. Usually a blood or exudative smear is made from a piece of diseased tissue and stained with a single stain such as gentian violet or methylene blue. However, the usual preliminary presumptive, laboratory identification stain for most pathogenic organisms is Gram's solution, with determinative culture transfers or specific agglutinations for very accurate diagnosis.

■ When an agreement between the veterinarians representing the interested parties in a case cannot be arrived at easily, or when the claim is likely to be large, the bacteriologist and the pathologist can do much to clarify the case. For example, a question may arise as to whether the pneumonia which caused the death of an animal was of infectious nature or of traumatic origin; in other words, the postmortem discloses that ribs have been fractured and the lungs punctured by the broken portion, yet the question remains: was the animal weakened from pneumonia, causing it to go down, and was it then trampled on by other animals?

In such cases the veterinarian must move with care. Of course, if it is a case of traumatic pneumonia, the railroad can be judged accountable for the death. If, however, the pneumonia was a sequel of shipping fever, hemorrhagic septicemia, or hog cholera, then the railroad is not accountable because, as before stated, the transportation company does not assume responsibility for any bacterial, protozoan, or other communicable diseases developing from natural causes before or during transit. The microscopic diagnosis may be of help in some cases, but is often of little value, especially if the time that elapsed since the injury took place is not known, or if the animal has been dead several hours before it can be examined by the veterinarian. In some cases, the pneumonia in the punctured lung will be found to be in such an advanced stage that there can be no doubt but that it existed long before the traumatism took place (the presence of consolidated areas in the lung simplifies the decision in such cases.) All other cases should be approached with care, and in the majority of them it will be the best practice to recommend to the carrier's representative that some settlement be attempted.

■ Lameness of animals, particularly horses, is a never-ending source of claims. Here the problem is much more difficult because the laboratory expert (except, perhaps, the x-ray diagnostician) can't help. The all-

*A veterinarian testifying as an expert witness has no responsibility for what the court does in the outcome of the litigation, and should evidence no concern in it. His function is to supply facts and conclusions (expert opinion) based upon those facts that will stand the test of scientific scrutiny. He is not trained as an advocate, and cannot but make a pitiful showing if he attempts that rôle. It is not within his province to "help" the attorney on either side in testifying to facts or in drawing his conclusions from the facts.

important questions are: first, whether the condition is acute or chronic, and second, whether the lameness developed from a recent injury, or from malnutrition or some other condition not involving recent injury. Recently a shrewd horse dealer tried to hold the railroad responsible for several cases of lameness which turned out to be ring bones, side bones, tendon sheath hygroma, and bone spavins, respectively. Undernourished, parasited or tuberculous hog runts have been presented for claims because they were weak and stiff and, apparently, lame from transit. Other hogs had rickets with enlarged joints; the shipper claiming that these joint swellings occurred during transit and that the railroad was therefore responsible. It is clearly necessary in such cases to differentiate between acute and chronic injuries or lameness.

A hog developed a large abscess over the ham, and was condemned on post-mortem examination by the veterinary inspector. Should the railroad stand the loss? Ordinarily the criterion in such cases is whether or not the condition is of recent origin. If the condition is acute, the affected part is usually hot, painful, and possibly swollen. Chronic lameness, on the other hand, is usually of the mechanical type involving little pain, no heat; and if any swelling is present, it is usually hard, flocculent, and encapsulated, fibrous, or even ossified.

■ In cases involving edema, lymphangitis, or purpura hemorrhagica, it is often difficult to determine within a period of a few days when the conditions originated. When an animal develops tetanus, the period of incubation is the deciding factor; if the transit period exceeds the incubation period, then the penetration which started infection may have occurred during transit. Generally speaking, the more severe the case of tetanus, the shorter the period of incubation, and *vice versa*, which should help the veterinarian in reaching a conclusion as to whether the infection occurred before shipment or while the animal was in the custody of the common carrier. Traumatic conditions such as lacerations, cuts, bruises, distortions, and sprains are usually diagnosed as recent injuries when pain or little healing is evidenced. (Differentiate between old and recent bleeding by noting the extent of any of the healing processes.) The railroad usually pays for such conditions with an amount commensurate with the extent of the injury and the cost of treatment. Small cuts and bruises are disregarded as a rule.

■ Some difficult decisions confront the veterinarian occasionally. A mule developed paraphimosis, with the penis refusing to go back into its sheath on manipulation. The consignee held the railroad accountable, claiming that the condition must have developed during transit. There had been no preshipment inspection, but the absence of redness around the area and the presence of some vaseline in the prepuce suggested that the shipper had tried to treat the case; the injury was therefore judged as having occurred before transit, and the railroad did not pay. However, this judgment was debatable.

A horse developed pneumonia and was unable to stand when unloaded. Treatment failed to bring any response; the consignee refused to accept the animal; and the railroad had the horse destroyed. The consignee claimed full damage for the loss of the animal, but lost the decision because the case was one of a clear-cut pneumonia which it was deemed had originated before shipment.

In a shipment of hog culls from a large western stock yards, there were 57 disease conditions, including: castration tumors, hernias, cysts, mammary tumors, mammary carcinomatosis, botryomycosis, atrophy of the shoulder, tendon sheath hygroma, exostosis metatarsi, hock hygroma, knee bursitis, fibrous tumors, multiple anal abscesses, atypically healed old fractures, hip dislocation with permanent fibrous tissue encapsulation, healed-over foot amputation, club foot, chronic deforming arthritis of all four fetlock joints, everted rectum, pendant ear cyst, lordosis, tubercular and parasitized runts, untrimmed elongated toes,

etc.—and the consignee presented claims on each animal so diseased! Obviously, the veterinarian employed by the railroad showed that all these conditions were pre-

have been cut or mutilated by representatives of the shipper to make it appear that they had been injured in transit, or to make the decision of the veterinarian diffi-

KANSAS CITY STOCK YARDS FIRE, OCT. 16, 1917

Approximately 12,000 cattle and 6,000 hogs were burned to death in this fire. The sheep division of the yards was not burned. The Hartford Insurance Company wrote a check for $1,733,779.99 to reimburse the Stockyards Company for the loss of animals. No attempt was made to salvage the carcasses. They were saturated with oil and burned where they lay.

shipment or chronic diseases, and claims for some $550.00 were scaled down to $11.00.

Of a shipment of some 200 hogs, 37 arrived dead, five more died within an hour of arrival, and several more were sick or dying. A post-mortem examination of the dead was refused; however, hemorrhagic discharges from nose, anus, and vagina, together with the characteristic hyperemic abdomen of all the dead and dying, conclusively proved that cholera was the etiological factor. The B. A. I. veterinarians later substantiated the diagnosis by condemning a whole line of the killed hogs which had been sick. The railroad did not pay for the dead, sick, or dying hogs, because they had been shipped at the time of a western outbreak of cholera, although the shippers attempted to incriminate infected cars as the cause of the outbreak.

In some cases, carcasses of dead animals

cult. This might mislead the inspector in his decision were it not for the fact that such cuts or mutilations can be identified readily as post mortem by the absence of blood. In one case, a butcher smeared blood over a post-mortem cut; this blood, however, looked too fresh for a hog in full rigor mortis, and when it was washed away, the anemic incision was disclosed. The claim on the animal was immediately dropped, since the attempted fraud was evident.

■ It will thus be seen that veterinary services are valuable from beginning to end when live stock are shipped. The veterinarian can protect the shipper by advising pre-shipment vaccination and giving a health certificate before shipment; his services are invaluable to the railroad when claims are involved; and the consignee too can rely on the veterinarian to protect his interests and treat his sick or injured animals.

Oxalic Acid as a Coagulative Agent

By L. J. MILLER, Warrenburg, Illinois and A. A. DAVIES, Kansas City, Missouri

At the suggestion of Dr. E. J. Frick, experimental work was carried out by the writers at the veterinary clinic of Kansas State College to determine the effect of oxalic acid injected intravenously in reducing the clotting time of blood.

Oxalic acid is a dicarboxylic acid, containing two carboxyl (COOH) groups.[1] It is prepared by the action of nitric acid upon sugar or starch or by fusing sawdust with a mixture of sodium and potassium hydroxides. It occurs as small, rhombic crystals, soluble in 10 parts of water, 2.5 parts of alcohol.[2] Oxalic acid is noncombustible in the body, especially in animals with a single stomach (in the paunches of ruminants a small amount is broken down by the activity of microörganisms), and it and any excess of other organic acids are excreted as calcium salts.[3] The physiological action of the acid is threefold: (1) It must not be forgotten that oxalic acid is a very strong acid—one of the most powerful of the carbon acids. The effect on the mucous membranes is indistinguishable from that of mineral acids—caustic or stimulant depending upon the concentration. This is the "local effect." (2) The "remote effect" is upon the central nervous system and upon the kidneys. Extreme languor may result in the first case, and the heart action may be affected. The effect on the kidneys is to clog them with calcium oxalate crystals. Oxalates are always found in the urine provided the patient lives. Death often ensues in from 10 to 30 minutes after administration of the acid.[4] (3) The effect upon the blood is described in the following.

The use of oxalic acid to stop hemorrhage was reported in Toronto, April 29, 1939, at the meeting of the Federation of American Scientists for Experimental Biology, by Arthur Steinberg and William R. Brown. Doctor Brown demonstrated upon himself that the drug is nontoxic in its effects. Oxalic acid in 3mg doses has been given to almost 1000 persons suffering from excessive bleeding due to hemophilia, gastric ulcers, childbirth, kidney and lung infections. In every case bleeding stopped within five minutes, the normal coagulation time, even when the patient had been bleeding for as long as two hours.[5, 6]

Case No. 1.—This was a two-year-old Spitz bitch, weighing 25 pounds. Three preinjection clotting times were taken; the determinations being made by means of the capillary pipette method. The time in all cases was one minute, 50 seconds. The dog was then injected with 5cc of rabies vaccine, and coagulation tests were run every 15 minutes for two hours, followed by five, hourly tests. All these tests showed a coagulation time of one minute 15 seconds. Twelve hours later the coagulation time had returned to normal—one minute, 50 seconds.

Case No. 2.—This was a nine-month-old, male, German shepherd, weighing 40 pounds. The preinjection coagulation time obtained as in Case No. 1 was two minutes. Seven cc of 5% oxalic acid solution in distilled water was injected intravenously. In 20 minutes the coagulation time was reduced to one minute, 10 seconds, and so remained for 16 hours. Twenty-four hours after the first injection, a second injection of 10cc of the same strength solution was made. In 30 minutes the coagulation time was reduced to 40 seconds.

Case No. 3.—This was a year-old collie, weighing 25 pounds. The preinjection coagulation time obtained as before was two minutes, 45 seconds. Thirteen cc of the 5% solution was injected intravenously. One and one-half hours later the coagulation time was one minute, 45 seconds. Toxic symptoms were observed two hours after injection. They included: stupor, dullness, vomition, lacrymation, icteric mucous membranes and weakness.

Case No. 4.—This was a five-year-old, brown, mare mule, weighing approximately 1000 pounds. Injection of 100cc of 5% oxalic acid solution intravenously reduced the coagulation time of the blood from 16 minutes to two minutes, after a 15-minute interval. Thirty minutes after injection the coagulation time had risen to six minutes.

Injection of 200cc of 5% oxalic acid solution intravenously produced toxic symptoms. The mule was depressed for 1½ minutes following the injection, standing with drooping

ears and hanging head. Thirty minutes after the injection the visible mucous membranes became icteric. Blood examinations before and after the injection gave negative results, except for a reduction in the red cell count (from 6,486,660 to 2,236,660).

The variations in clotting time are shown in the following table:

Time after Injection	Clotting Time
15 min.	1 min. 30 sec.
30 min.	2 min.
45 min.	6 min. 30 sec.
1 hour	5 min.
1 hour 15 min.	4 min.
1 hour 30 min.	2 min.
2 hours	11 min. 45 sec.
2 hours 30 min.	13 min.
3 hours	14 min. 15 sec.
3 hours 30 min.	15 min.
4 hours	15 min. 40 sec.
4 hours 30 min.	16 min. (normal)

The injection of this strength solution of oxalic acid intravenously by means of a syringe is attended by some irritation. For the second injection of the mule, an intravenous outfit (gravity feed) was used, and apparently prevented this irritation, since the animal stood quietly during the injection. The first injection, made with a syringe, was irritating; the mule, like the dogs, showed this by quivering, fighting the injection and sweating.

Summary

On the basis of these three experiments it may be said that oxalic acid injected intravenously is a valuable agent to reduce the coagulation time of blood. Doses of 7cc of a 5% solution for a 40-pound dog and 100cc for a 1000-pound mule were found to be nontoxic. Doses of 13cc for a 25-pound dog and 200cc for the 1000-pound mule produced toxic symptoms: weakness, dullness, icterus due to destruction of red blood cells, lacrymation, and vomition.

The experiments of Drs. Steinberg and Brown, as well as these experiments, indicate that oxalic acid, which is poisonous when administered per os, is nontoxic when used intravenously in the proper dosage. In the dog, it gives better results as a preventive of hemorrhage, and is more economical than other agents. Care should be taken not to approach the toxic dose, in order to avoid hemolysis.

Of course, no final conclusions can be drawn from so few cases. No one can be sure the doses given were as harmless as they appeared, or that even if harmless in normal animals that they might not be harmful in animals suffering shock from loss of blood. Following the toxic dose given the mule an extreme fall in the erythrocyte count was noted. Possibly a parallel fall from half this dose might occur if the volume of blood had been greatly reduced by hemorrhage. The time required for the erythrocyte count to reach normal was not determined. This report must not be construed as a complete answer to the question as to the value of oxalic acid intravenously as a hemostatic agent, but rather as a contribution of certain facts involved in the answer.

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Criminals Wanted

The Federal Bureau of Investigation is desirous of locating John Christopher Abele and his wife and Roy Douglas Brown and wife. Both have long criminal records and are wanted for new crimes. Abele (alias Allen), age 36, height 5 feet 9¼ inches, weight 160 pounds, owns a French bulldog named Captain Bouvaine. Brown, age 37, height 5 feet 9 inches, weight 155 pounds, has two wire-haired terriers, one of which is blind. Both these persons have taken their animals to veterinarians in the past and it is thought they may do so again.

Anyone receiving any information concerning these persons or any of them is requested to communicate with the Federal Bureau of Investigation, Washington, D. C., by telegraph collect.

Soy Bean Oil Meal—Up-to-Date*

By R. M. BETHKE, Columbus, Ohio
Ohio Agricultural Experiment Station

SOY BEAN oil meal is a comparatively new product. The first large-scale operation of expressing oil from soy beans was in 1922, when one company in Decatur, Illinois, processed about 90,000 bushels. During the intervening 17 years the soy bean processing industry has grown until soy bean production in this country reached a peak of 57,000,000 bushels this past year. It is estimated that about 75% of this production was processed; yielding a total of approximately 1,000,000 tons of soy bean oil meal—over 90% of which is fed to live stock, including poultry. The great increase in the production of soy bean oil meal during the past 17 years is of itself indicative that the product must have merit. These facts are still more significant when we realize that the production of meal during the past 10 years has increased approximately 48 times (from 21,000 to 1,000,000 tons), during years when feedstuffs, except for one or two years, were plentiful and relatively cheap.

■ The seeds of the soy bean are the richest in protein of all the common seeds used for feed, averaging 35 to 36%. Furthermore, soy bean protein is of good quality to supplement the proteins of the cereal grains. In fact, soy beans and peanuts provide proteins of better quality than other common seeds or the by-products from the seeds. They are excelled in quality of protein only by feeds of animal origin, such as milk, meat, and fish. In addition to their richness in good protein, soy beans contain, on the average, 17 to 18% fat and are low in fiber. Moreover, they furnish more total digestible nutrients than the grains and other common concentrates.

It has been shown that soy beans are in general a satisfactory and valuable protein supplement for dairy cattle, beef cattle, sheep and horses. Because of the high fat content of soy beans, stock sometimes tire of them if they are fed in large amounts for an extended period. Whole or ground soy beans, however, are not satisfactory for swine or poultry feeding. They cause "soft pork" in pigs when fed in amounts necessary to balance the grains in respect to protein; which decreases the value of the dressed carcass. Cooking the beans greatly improves their value for swine and poultry feeding; however, this procedure does not counteract the softening effect of soy beans on the carcass of swine. Soy bean oil meal, on the contrary, does not cause "soft pork," because the major portion of the oil of the beans has been removed.

Soy bean oil meal is especially rich in protein, and the protein is of good quality. Experiments in general have shown that soy bean oil meal is comparable in feeding value to the common vegetable protein concentrates for cattle and sheep. In case of swine and poultry, properly processed soy bean oil meals have been found to be equal to and in certain instances superior in protein value to the common vegetable protein concentrates.

■ Three different methods are employed in the production of soy bean oil meal. These are the hydraulic, expeller and solvent methods. Practically all of the present commercial meals are produced either by the expeller or the solvent method. Meals produced by the hydraulic and expeller methods contain a minimum guarantee of 41% protein and 4% fat; those manufactured by the solvent extracted method are guaranteed to contain not less than 44% protein and 0.5% fat. Sufficient heat is usually applied in the hydraulic and expeller methods of oil extraction to give the resulting meals a toasted taste and odor. In the solvent method not enough heat is applied to impart that palatable toasted odor and taste to the meal; and the meal has been found to be of lower feeding value

*Presented at the 2nd Annual Nutrition Conference for Veterinarians, Decatur and Ft. Wayne, Ind., July 12, 1939.

for swine and poultry than a properly prepared expeller product. However, recent experimental work has shown that when the solvent extracted meal is properly heat-processed after the removal of the solvent a palatable meal of good feeding value results.

Experimental work generally has shown that swine and poultry are more particular about the taste or palatability of soy bean oil meals than cattle or sheep. Research with swine and poultry has revealed that soy bean oil meals which are not processed properly to give the meal a mild, toasted taste and odor are of lower feeding value than similar meals which possess these characteristics. For this reason, expeller meals have been preferred to the solvent-extracted meals for these species. However, recent experiments with chicks at the Ohio Station, in which expeller and heat-processed, solvent-extracted meals were compared on the same protein basis in three different rations, showed that the heat-treated, solvent meal was comparable to the expeller meal in feeding value. Unpublished results from the Ohio Station with pigs also show that a properly heat-processed, solvent-extracted meal is equal to expeller meal in feeding value.

■ Within recent years considerable attention has been given to the fat content of the grain ration of dairy cattle, because Maynard and associates of Cornell reported a few years ago that milk production was decreased when cows were fed rations low in fat. More recently the Cornell investigators found that cows fed a concentrate mixture containing 5.27 to 6.33% fat produced 2.55% more fat-corrected milk than the same cows fed similar concentrate mixtures containing 3.09 to 3.35% fat. Huffman and associates of Michigan also reported recently the results of a short-time reversal experiment in which they compared a high fat and a low fat ration. The addition of soy bean oil to the basal ration low in fat resulted in an increase in milk production. These findings raise the question: what about the comparative value of soy bean oil meals of different fat contents (expeller and solvent) for dairy cattle? Last year Doctor Huffman, who appeared on this program, stated, "We believe that the solvent meal is perfectly satisfactory as a supplement to home-grown feeds, provided corn and oats make up a large part of the grain mixture." In my estimation, further experimental work is needed before we will have all the answers to the "fat problem" in dairy cattle feeding. Until we obtain that answer, it occurs to me that the dairyman in the corn belt can assure himself of adequate fat in his dairy ration by the judicious use of corn and oats mixed with vegetable protein concentrates, including either expeller or solvent soy bean oil meals.

■ Soy bean oil meals are lacking in certain minerals, especially calcium and to a certain extent phosphorus. For this reason, particular attention needs to be paid to mineral additions when liberal amounts of soy bean oil meals are used in poultry and hog rations. Like other protein concentrates, soy bean oil meals are deficient in certain vitamins, which fact must be taken into consideration in their use in poultry rations.

■ New products, no matter how good they may be, usually are credited with certain "ill effects." Soy bean oil meals are no exception. Ketosis in cattle has been ascribed to the feeding of soy bean oil meal. No evidence supporting such a view has come to my attention. Ketosis has been observed in cattle where soy bean oil meals or soy bean products have never been used. Likewise, we frequently hear statements that soy bean oil meals cause "soft pork" or poor quality beef. These statements are not supported by facts. Occasionally we hear it said that the use of soy bean oil meal in a breeder ration causes decreased hatchability of the eggs. The facts are that excellent hatchability has been obtained on rations containing soy bean oil meal.

Research work in general has shown that properly processed soy bean oil meal is a good feed for all classes of live stock and that its judicious use is attended with good economical production.

The Three of Us—The Feed Industry, The Veterinarian and the Live Stock Producer*

By PAUL GERLAUGH, Wooster, Ohio

PROGRESS in the live-stock industry owes much to the improved rations supplied by the feed industry and to the veterinarians for better protection of animals from disease. There is every reason to believe that if we continue on the premise that what is best for the live-stock industry is best for those dependent upon it, further progress is assured.

Meat animals are going to market at lighter weights than was the case 25, 50, or 100 years ago. It is frequently stated that this trend is due to the demand of consumers for lighter weight cuts of meat. Undoubtedly this is a factor, but I should like to raise the question as to whether a cattle producer could take the feeds that were available 50 to 100 years ago and produce an animal of 800 to 1000 pounds in weight that would carry sufficient finish to attract a market price comparable with cattle of the heavier market weights. I sincerely doubt it.

Breeders have given us earlier maturity in present-day, meat-type animals, but I feel the development of protein concentrate supplements to farm-grown grains is chiefly responsible for our being able to produce fat animals of the lighter weights.

Linseed meal, cottonseed meal, tankage, fish meal, dried milk, and during the recent past soy bean meal coming into the feed supply have made available to an increasing number of feeders protein supplements at a price that permitted them to capitalize on the efficiency and economy of gains possible only in the younger animals.

There is not available as yet enough of the protein concentrates to combine with our corn crop to make the most efficient use of it in the feed lot. Naturally, the price levels of feeds and live stock determine how much of the supplements feeders can purchase.

Men working in the field of nutritional research are responsible for a great share of the development of more efficient rations through the use of protein concentrates.

The faster rate of gain involved in finishing younger animals entailed problems of health due, for the most part, to a lack of minerals and vitamins. Here again those in nutritional research showed how rations may be fortified with minerals and vitamins to obtain satisfactory results. Certainly, the use of proteins, minerals, and vitamins has made possible good results from raising fall farrowed pigs and, as a result of this, a higher proportion of our hog crop is being produced from fall litters. The poultry industry has doubtless made as great, if not greater, progress in eliminating seasonal production than any other group.

The veterinary profession can point with a great deal of pride of accomplishment to: (1) Eradication of foot and mouth outbreaks in this country; (2) putting tuberculosis under practical control; (3) controlling hog cholera, and (4) measurable success in the control of Bang's disease and numerous other diseases. I see no reason for crediting the field of nutrition with much in the way of contributions to these achievements. However, the field of nutrition has certainly made worth while contributions in helping the veterinarians solve the problems involved in milk fever, hairless pigs, rickets, some forms of sterility, and numerous other disorders that continually arise. Some recent work with enteritis in pigs encourages the feeling that this trouble is about to be much better understood and probably prevented, through proper feeding.

The field of preventive medicine is certainly growing and involves an increased knowledge of the nutrition of live stock. It is very much in order to say that confer-

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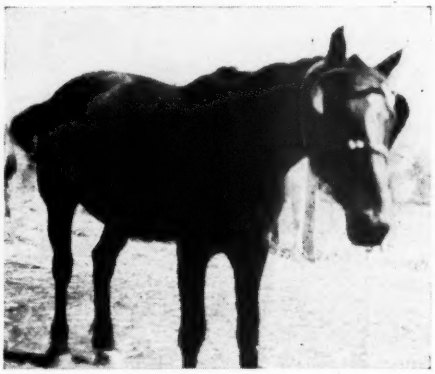
ences such as this have this very point in mind and are quite constructive.

I should like to say that the increased acreage of soy beans and the production of soy bean oil meal is a major development in our agriculture and for our live-stock industry. There are bound to be some



Acute indigestion caused by overloading of the stomach

difficulties arise relative to the proper use of soy bean oil meal in rations. The feed at present is well enough understood so that such difficulties can be ironed out as they show up.

There are some who blame soft pork and off-colored beef upon the use of soy bean oil meal. It has been thoroughly demonstrated that soy bean oil meal does not produce soft pork; and I know of no reason for saying that soy bean oil meal in the ration of fattening cattle produces any off color in the carcasses. We have used whole soy beans at the rate of 1.8 pounds a day for yearling steers and at the rate of 2.0 pounds a day for heifer calves with favorable reports on the carcasses. We have used soy bean oil meal as 30% of a supplement, fed at the rate of 2.4 pounds daily, to steer calves without producing any off colors in the carcasses. Other stations have used larger amounts of soy bean oil meal in rations for fattening steers without producing off color in the carcasses.

Live-stock producers are mindful and appreciative of the contributions made to the live-stock industry by feed manufacturers and veterinarians, both of whom have been materially helped by those in the field of nutrition.

Future developments will be hastened by "The Three of Us" working together for the betterment of the live-stock industry.

Magnesium Sulphate for Equine Colic

Following a suggestion of my esteemed friend and veteran equine practitioner, Dr. S. E. Hershey, of Charleston, W. Va., I have been trying injections of magnesium sulphate in sterile solution for cases of equine colic.

The product that I use is put up in 20cc sealed ampoules. I use an extra long needle, making the injection in the shoulder region just below the scapulo-humeral articulation. I let the needle run sloping downward and inward until I can feel it slip between the muscles, then inject the entire contents of the ampoule, preferably along the border of the humeralis obliquus muscle.

So far, I have had an opportunity to use it in only two cases, both severe cases. Both horses showed marked improvement almost immediately after the injection, and both made speedy recoveries.

This does not prove, of course, that it will be always beneficial, but I am so well pleased with it that I have added it tentatively to my routine colic treatment, and recommend it to my brother practitioners as being at least worth a trial.

I have long since learned that the fellow that says he never loses any cases of equine colic is either a "blow-hard" or has a very limited equine practice.

REMBRANDT MORGAN.

Winfield, W. Va.

Ticks are very hardy. They can live from year to year with no food. Adult ticks put in vials without food have been alive and vigorous after more than three years. Hence it cannot be taken for granted that an area is tick-free; new infestations may appear.

Erysipelas in Cattle

So far as I have been able to find, there has been very little mention of erysipelas in cattle in veterinary literature.

In my practice I have encountered in cattle, the three distinct types that occur in swine: septicemic, mild and chronic.

In the septicemic form, death is very sudden, and there are usually no visible symptoms before death, except perhaps an edematous swelling in the maxillary region. The temperature ranges from 104°F. to 108°F. The milk flow is not disturbed. Death is preceded by rapid respiration and muscular tremors, followed by sudden collapse or coma.

In the mild form of the disease the symptoms I have noted are: stiffness, swollen joints, swelling about the head involving eyes, ears, face and throat. Some animals go down in the back; others knuckle over at the fetlock, assuming the position characterized by walking on the toes, so often seen in hogs. I have also seen nervous disturbances, the animal staggering, with head drawn back and eyes rolling and occasionally falling. These nervous symptoms occur at intervals, lasting only a few minutes, and the animal appears normal between seizures.

In the chronic form about the only visible symptoms are the skin lesions, which usually occur on the tail, head, scrotal region, flanks and under the front legs, on the brisket, neck, in and on the ears, nose and lips and on the udder. These lesions are identical to those found in hogs suffering from swine erysipelas.

On post-mortem examination there are fibrous growths in the pleural and peritoneal cavities, covering the pericardial sac,

VIEWS OF AFFECTED CATTLE

Fig. 1. The septicemic form of swine erysipelas that is often mistaken for milk fever.

Figs. 2 and 3. This animal is afflicted with the chronic form of the disease, showing the peeling off characteristic of that form.

Figs. 4 and 5. The mild form of swine erysipelas is signalized by arthritis and walking on the toes, as in young hogs similarly affected. This is the form that has been mistaken for tetanus.

diaphragm, paunch and intestines. There is a considerable accumulation of fluids within the body cavities. The kidneys are slightly to greatly swollen; the spleen is swollen and there are some petechial hemorrhages on the surface, and a few on the serous membranes. The gall bladder is always enlarged; I have found some as large as six inches wide and eight to nine inches long. The consistency of the bile is normal. The bile ducts are all open and the liver is usually filled with bile. The abomasum shows the red rose patches that Breed mentions as diagnostic of swine erysipelas. The heart contains large ante-mortem clots, and the growths found under the nitral valves are identical to those found in hogs. I also find muscular degeneration, gas gangrene and emphysema, the latter strongly resembling that found in blackleg, a fact which has led to the diagnosis of this condition as blackleg by some veterinarians.

Cases of the mild form, showing arthritis and stiffness, have been erroneously diagnosed as tetanus. Cases of the septicemic form showing excessive lacrymation, swollen eyelids, and a deep coma, bear some resemblance to milk fever, and two of my cases had been diagnosed as such before I made my diagnosis of erysipelas, which was confirmed by post-mortem examination.

I have been using swine erysipelas serum on these cases with good results, especially in the mild and chronic forms. I have also treated three outbreaks of the septicemic type in sheep, using swine erysipelas serum, given in two doses.

S. R. DUNN

Corpus Christi, Tex.

* * * *

Pseudomonas aeruginosa was found to be associated with and probably the cause of an epizoötic of mastitis of extreme severity in the cattle herd of the Bureau of Dairy Industry at Beltsville, Md. Seventeen cows were affected in a period of a little over a month. The organisms persisted in the milk of affected quarters long after acute symptoms of the disease subsided and in at least one instance in a subsequent lactation.

Traumatic Ventral Hernia in a Calf

An emergency call was made by the ambulatory veterinary clinic of Kansas State College, March 21, 1939. The patient was a six-month-old Jersey heifer calf which

Traumatic ventral hernia in a calf

had been gored by a bull. A loop of small intestines covered with omentum was forced through rent in the skin and the abdominal wall on the right side anterior to the flank region.

The area was clipped and mercuric chloride, 1-2500, was used to clean the skin and exposed intestine. An attempt to return the intestine to the abdominal cavity was unsuccessful. It was necessary to enlarge the opening by cutting the abdominal wall before the intestine could be replaced. The peritoneum and two muscle layers were closed with catgut in a continuous suture. The skin opening was closed with an interrupted suture, leaving an opening at the lower portion for drainage. To stimulate leucocytosis, 125cc of a 1% solution of hydrochloric acid was given intravenously.

The owner was advised to keep the animal quiet and to reduce the amount of bulky feed. On April 3 the animal had recovered with no secondary complications.

HENRY LOUGHRIDGE,

Wenona, Ill.

Sorghum Grain Toxemia in Feeder Calves

An ambulatory squad of Kansas State College encountered an interesting disease of feeder calves March 20, 1939.

The history related by the owner was as follows: Eight grade feeder calves, about six months of age, had been doing well on a ration consisting of yellow corn, low-grade alfalfa hay, and cut corn stalks pasture. However, on March 12, the corn was almost entirely replaced by unground sorghum heads. The calves were allowed all they could eat twice daily. The first trouble was noticed three days later when one of the calves became lame, developing a stiff, staggering gait, and began to scour.

Similar symptoms developed in the remaining calves within the next few days combined with rough coats and loss of weight. The climax came with the death of one calf March 20. There was no sign of inappetence with the exception of the animal that died which had failed to eat the night before.

Clinical Observations.—We found varying degrees of lameness and diarrhea in most of the remaining animals. All had rough coats and were in rather poor flesh. A roan heifer that seemed to be in the worst condition went down upon our entrance into the lot. The owner reported that it had been down and in convulsions earlier that morning and he had thought it was going to die. This calf showed a temperature of 101.5°F., pulse 70 and respirations 80. The remaining calves showed temperature not exceeding 102°F., excepting one which had a temperature of 104°F., but to all appearances was the least affected of the lot.

Two more animals died during the night.

Post-Mortem Lesions.—Post-mortem findings on the three dead animals were nearly identical. In each case the abomasum was filled with whole sorghum grain and the mucous lining showed varying degrees of inflammation from congestion to severe and general necrosis. The mucous lining of the intestines was congested and small hemorrhages were scattered under the serous coat. The mesenteric lymph glands were swollen and slightly congested. Subendocardial and subepicardial hemorrhages, small hemorrhages under the capsule of the spleen, slightly swollen and congested kidneys and liver completed the picture. The remaining lymph glands, the lungs, the muscles, bones and joints were apparently normal.

Laboratory Findings. — Blood samples were taken from each of the animals. Both the white and red cells were normal in kind and number. There was no anemia. Tests for phosphorus revealed 9.8 to 11.2mg per 100cc of serum as compared to a normal of 6 or 7 mg. Calcium was present in amounts of 10.99 to 12.28mg per 100cc of serum as compared to a normal of 10 or 11mg, making the Ca/P ratio about 1:1.

Diagnosis.—A clinical diagnosis of toxemia probably resulting from the whole sorghum grain was made.

The lack of high temperatures, epizoötiology, post-mortem findings, history, and the fact that none of these fitted in with any infectious disease described, seemed sufficient to rule out the possibility of infection as the primary cause.

Treatment. — Three of the remaining calves were treated as follows: One received 500cc of 25% dextrose intravenously; another 250cc of 23% calcium gluconate intravenously; and the third, a pint of commercial detoxifying agent containing glucose, methylene blue, sodium nitrate and sodium thiosulphate. The remaining two calves were not treated.

The owner was advised to remove the sorghum heads from the ration and put the calves on a good grade of alfalfa hay with steamed bone meal added as a mineral supplement. He was further advised, if possible and practical, to put the calves on wheat pasture.

Termination.—At present (April 15) no more deaths have occurred and the calves are doing nicely. The owner has carried out the above advice, and is slowly bringing the animals back on a grain ration of corn.

E. L. TAYLOR.

Tallulah, La.

Squamous-Cell Carcinoma of the Penis

March 18, 1939, a 1000-pound, ten-year-old bay gelding with a malignant growth on the penis was brought to the veterinary clinic of Kansas State College. The growth, which had come on rapidly, had been first noticed by the owner about two months previously. Otherwise the horse was normal and in good condition.

The tumor, five inches in diameter, involved the entire end of the penis for a distance of about six inches, causing paraphimosis. Involvement of the urethral process resulted in dysuria, with occasional nervousness and restlessness.

The neoplasm had infiltrated and partially destroyed the normal tissue at the end of the penis, forming an enlarged mass approximately three times the normal diameter. This mass was covered by diffuse, reddish, eroded nodules, of a firm consistency. Posterior to this the nodules became less numerous and lighter in color; they extended about half-way back to the preputial ring. There were also some grayish-pink areas on the epithelium of the prepuce which closely resembled the nodules on the penis. A biopsy revealed that the sheath and the posterior part of the penis were free of neoplastic tissue, grayish-pink areas on the epithelium of the sheath representing diffuse areas of inflammation.

From its macroscopic appearance, the neoplasm was tentatively diagnosed as a squamous-cell carcinoma, the most common type of neoplasm found on the penis. After amputation the neoplasm was sectioned and studied microscopically, and this diagnosis was confirmed.

Operative Procedure.—The horse was given 1½ ounces of chloral hydrate per os 30 minutes before the operation, and confined in the lateral recumbent position. A metal catheter was introduced into the urethra and passed above the region of amputation. A gauze bandage was fastened around the penis just above the glans and anchored to a front leg. The penis and sheath were washed and disinfected with a 1% solution of potassium permanganate. A rubber horse catheter was used for a hemostatic ligature around the penis just above the preputial ring. Twenty cc of a 1% solution of procaine was infiltrated into the operative area for local anesthesia.

A triangular incision was made on the ventral surface of the penis directly over and down to the urethra, the base of the triangle being anterior and the sides 1½ inches long. The tissue in this area was dissected away without injuring the urethra. Then a longitudinal incision was made through the urethral wall from the apex of the triangle to its base, and the wall sutured to the skin with No. 10 braided silk. A series of continuous sutures was inserted, starting at the apex of the triangle and continuing down to its base.

The penis was amputated through the normal tissue posterior to the neoplasm, using the flap method; the incision was made so that a wedge-shaped piece of tissue was removed with the neoplasm, leaving a dorsal and a ventral flap on the newly-formed end of the penis. The flaps started even with the base of the urethral opening and extended anteriorly about three inches. To unite the dorsal and ventral flaps, a continuous suture of linen suture tape was used. The needle was inserted through the skin, then deep into the tunica albuginea, and out through the skin of the other flap. The hemostatic ligature was removed. Suturing the flaps together controlled hemorrhage, making the operation nearly bloodless.

There was little swelling following the operation. The horse made a rapid recovery and was discharged from the clinic in three days. The prognosis, however, was guarded, as a stricture of the urethral opening or a recurrence of the neoplasm may take place later.

RAYMOND A. JONES.
Marionette, Wis.

Death Losses in Newborn Pigs*

By L. P. DOYLE, Lafayette, Indiana
Veterinary Department, Purdue University

DEATH losses in baby pigs often present a serious problem for the swine producer. The losses discussed here are apparently not related in any way to brucellosis in swine, although this infection is an important problem in a good many breeding herds. The death losses in which we are now interested occur in pigs that are born at full term, and of sows that are apparently healthy. Ordinarily these pigs appear normal at birth and usually nurse within a short time. In a few days, however, they weaken and die.

The symptoms associated with these pig losses are sometimes not clearly defined. Death may occur at any time from several hours to several days after birth. The bulk of the loss probably occurs on or about the third day, but may continue for seven or eight days. The symptom commonly observed is apathy, causing the pigs to remain in the nest almost constantly. In some instances, however, the pigs wander aimlessly about and may be found scattered promiscuously on the floor of the farrowing pen or house. This apathy or lack of vigor is probably fundamentally responsible for many deaths that are attributed to the pigs being "laid on" by the sow; an active, vigorous pig will usually keep out of the sow's way as she lies down in the nest. When affected pigs are handled, they often emit an abnormal squeal. Farmers sometimes refer to this as a "graveyard squeal," because their experience has shown that death of the pig is likely to occur within a few hours. A careful examination of moribund pigs will often show an edematous thickening of the subcutis, particularly along the ventral side of the neck.

Post-mortem examinations made on a large number of pigs from field cases and from experiments have shown certain lesions to be fairly constant. The most nearly constant pathologic change found has been in the liver. This organ is increased in size and is more friable than normal. In some cases the liver becomes so friable that it ruptures spontaneously. It seems that rupture of the enlarged liver sometimes results from a slight pull on the umbilical cord. When the liver ruptures, considerable blood or bloody fluid may be found in the abdominal cavity. In pigs that die naturally, the liver is usually dark or reddish due to congestion; but in pigs that are bled out, the liver is usually light colored. The subcutaneous edema already mentioned is most apparent on the ventral side of the body in the neck region, but may also be seen along the abdomen, particularly in the inguinal regions. In some instances there is an increased amount of fluid in the abdomen and thorax. The opinion held by some farmers that the sows do not produce milk, hence that the pigs merely starve, has not been supported by post-mortem findings. Usually the stomachs of the dead pigs are well filled with milk.

■ When we come to consider the cause of the death loss in new born pigs, we realize, of course, that we are approaching the most important phase of the problem .Probably every practicing veterinarian knows of instances in which some farmers succeed in avoiding important losses of baby pigs, while other farmers who apparently use similar methods experience heavy losses. In these instances careful and detailed analysis of the methods of feeding and managing the brood sows during the gestation period may show important differences that were not at first apparent. The task of finding out just how a farmer has fed his brood sows during the gestation period is not always an easy one. If the sow has been on pasture or on range during the gestation period, she may have eaten a variety of materials in addition to what the farmer fed her. If she has had access

*Presented at the 2nd Annual Nutrition Conference for Veterinarians, Decatur and Ft. Wayne, Ind., July 12, 1939.

to pasture or range, but has been fed liberally on grain, she may have depended solely on the grain for sustenance. In this discussion, particular emphasis is being placed on what the sow eats during the gestation period, because our experimental results suggest that this factor greatly influences the viability of newborn pigs.

In answering the question as to what ration the sow received during the gestation period, the farmer's reply frequently indicates that an excellent ration was fed; still, unsatisfactory results were obtained. Further questioning often brings out the fact that this ration was fed during only a part of the gestation period and that grain alone was fed during the other part of the period.

■ A few years ago the Veterinary Department of Purdue University started a series of experiments for the purpose of studying death losses in newborn pigs. In these experiments particular attention has been paid to what effect the ration fed to the brood sow during the gestation period may have on the death rate of baby pigs. The brood sows used were nearly all gilts. As soon as the sows were bred, they were placed in inside pens in a hog house having a concrete floor, and were kept there throughout the gestation period. For the most part simple rations were used.

A number of comparisons were made between the effect of feeding a ration made up of grain and mineral and one containing dried milk, tankage or meat scraps in addition to the grain and mineral. In some experiments the grain was limited to corn, while in others corn and oats were used.

The skim milk, tankage or meat scrap was fed at the rate of six to eight pounds per 100 pounds of feed. Two per cent of mineral was added to all of the feed. The sows were fed from four to six pounds of feed per sow per day during the latter part of pregnancy. The amount fed earlier was somewhat less.

In these experiments 110 sows farrowed 886 pigs. Thirty-one sows which received only grain and mineral farrowed 250 pigs; while 79 sows which were fed dried skim milk, tankage or meat scrap in addition to grain and mineral farrowed 636 pigs. Thus, it is seen that the average number of pigs farrowed per litter was about the same in the two groups. However, a tabulation of the death rate in the pigs up to one week of age showed a striking difference which apparently can be attributed to the ration fed to the sow during the gestation period.

Of the 250 pigs farrowed by sows which had been fed grain and mineral, 44% were either born dead or died within the first week. Of the 636 pigs farrowed by sows which had been fed skim milk, tankage or meat scrap in addition to the grain and mineral, 11% were either born dead or died within the first week. To state the results in another way, the percentage of surviving pigs at the end of the first week was 56 as compared with 89; the mortality being four times as high in the one lot as it was in the other.

It is interesting to note that there was not a great deal of difference in the percentage of pigs born dead in the two groups. The sows which had been fed grain and mineral farrowed 7% dead pigs, while 5% of the pigs farrowed by the sows which had received animal protein were born dead.

All of the pigs that died in these experiments were subjected to post-mortem examination; and microscopic examinations were made of the various organs. Moreover, apparently healthy pigs from the normal litters were killed for comparative studies. The gross lesions found in the pigs that died were similar to those already described. The microscopic examinations showed that the pathologic change in the liver is essentially a degenerative fatty infiltration. In pigs that lived for about three days and then died, the microscopic examination revealed large quantities of fat in the liver. The kidneys also showed degenerative changes in many cases.

■ From these findings, it appears that the feeding of a good quality of protein to the sow during the entire gestation period may be expected to reduce mortality in baby pigs.

Swine Erysipelas and Diet

In the December, 1938, issue of VETERINARY MEDICINE (p. 585), reference is made to some results obtained in experimental work on swine erysipelas. I would like to have more information concerning this work. If the results are as phenomenal experimentally as this abstract indicates it would seem to me that the administration of a high percentage of lime in the ration would almost entirely obviate the probability of swine contracting this disease. We are having many outbreaks of swine erysipelas here. It is particularly unpleasant to handle on account of the uncertainty of its spread and the short duration of immunity produced by the use of serum. I am advising the addition of calcium to the ration. My observations have not extended over a sufficient period as yet to give me any assurance as to the efficacy of this measure. —*G. A. H.*, Iowa.

Comment.—We have no further information concerning the research to which you refer than that given in the abstract. It is generally believed that improper diet is an important factor in the susceptibility of swine, not only to erysipelas, but to many other diseases also. It has also been noted, particularly during the last few years, that an imbalance of calcium and phosphorus and vitamin deficiency have been important factors in the loss of swine. Drouth and depletion of soils are apparently primary factors in swine disease.

Paraplegia due to calcium deficiency

We suggest that you continue your observations and experiments on diet and mineral supplements, and particularly the relation of calcium and phosphorus, and vitamins, and present the knowledge gained in the form of an article for publication in the not far distant future. Such an article should stimulate a lively discussion from practitioners and others.—*A. T. K.*

* * * *

Porcine Brucellosis

Inquiry.—In a herd of 50 spotted Poland China sows and gilts, 10 or 12 aborted 60 to 75 days after breeding. I took samples of blood from four sows and the herd boar to a laboratory, and they all showed a strong agglutination reaction for Brucella organisms in dilutions up to 1-200. Several sows and gilts are showing advanced pregnancy now. This man bought three bred gilts and the herd boar in Iowa in January, 1939, and the Iowa gilts were the first to abort. What would you suggest?—*G. S. K.*, Mo.

Comment. — Your description of this malady is in accord with porcine brucellosis. The positive reaction to the agglutination test verifies the diagnosis. It is probable that the infection in this herd was introduced with the three gilts and boar that were purchased from another breeder. The infection of porcine brucellosis usually is more or less localized in the genital organs, mammary glands, joints, etc. There may or may not be extensive abortions. To some extent the infection is self-limiting and abortions may not result in extensive sterility.

Unfortunately, there is little that can be done other than to quarantine aborting sows and employ efficient sanitation and good care. Some breeders have kept aborting sows and produced practically normal farrows. There is a possibility of the porcine infection being transmitted to cattle, but bovine infection is usually from cattle, not swine.

We shall be pleased to have further comments from readers of VETERINARY MEDICINE.—*A. T. K.*

Continuation Schools for Veterinarians in Poultry Diseases*

By E. S. WEISNER, East Lansing, Michigan
Michigan State College

DURING the fall and winter of 1938-39 a series of four schools in Poultry Diseases were conducted for groups of veterinarians, particularly those located in the lower two tiers of counties in Michigan.

Before any mention is made of the Schools some explanation should be made as to why they were developed, my aim in regard to their continuation and the hope of their future.

Often in poultry extension meetings we have told farm groups that they could do more toward developing a successful poultry flock by spending a few hours in study and contemplation during the winter months than from days of actual work with the chicks during the brooding season. If this was good advice a better and more effective extension program could be developed by a similar study of poultry conditions.

The conclusions of such a study are interesting and were fundamental in the development of the Continuation Schools for Veterinarians in Poultry Diseases.

It is very apparent that the rise of the poultry industry during the past 20 years has shown a far more rapid growth than has any other livestock industry. Poultry is kept on 83% of Michigan's 196,000 farms to the extent of more than eleven million birds. A striking point of this analysis is an apparent trend toward increase in the number of small poultry flocks—flocks of from 50 to 100 birds.

Some of the reasons for this increase in what were once termed back-yard flocks, include the development of small farms by factory and other city workers. These are located in suburban areas adjacent to our industrial cities and are an attempt to assure economic independence during periods of unemployment. The extension of rural electrification tending to simplify brooding practices has been a great impetus to increased poultry raising. Too, relatively cheap feed in the several years following the drought has stimulated chick raising.

The increase in the number of people raising poultry without previous experience in handling livestock and having a minimum of equipment, inadequate housing facilities, limited range and no thought or knowledge of diseases and their control did not show a situation conducive to the successful enjoyment of their poultry enterprise. Many of this group, if I may politely exclude the larger poultrymen and hatchery operators, make no provision for growth of chicks or range for growing stock, they have no knowledge of practical poultry management, readily become the prey for the unscrupulous remedy salesman and are too often marked for failure before they are well begun.

Simultaneously as these conditions were revealed, there was an ever increasing chick and pullet death loss. Mortality records from practically any flock or area one wishes to study, show that death losses in poultry continue to become a greater problem each year. The advent of fowl pox, and laryngotracheitis vaccines to control these two hazardous diseases and the development of the rapid whole blood stained antigen test for the removal of pullorum disease reactors have been of great benefit to the industry, yet death losses show a marked annual increase.

Rural areas are flooded with literature advertising proprietary remedies. These contacts are followed by salesmen making house to house visits to sell remedies. These men pose, by means of field diagnosis, to be able to differentiate between fowl cholera, fowl typhoid, pullorum disease and other bacterial infections and are equipped to offer specifics in every instance. It is very true that often a post-mortem exami-

* Address at the Second Nutrition Conference for Veterinarians, Decatur, Ind., July 12, 1939.

nation is all that is necessary to diagnose disease in poultry, but the basic training of the person performing the autopsy must be adequate.

There are other ways to explain the situation but the foregoing affords a fairly good picture of poultry conditions in Michigan when I became a full time Poultry Extension Specialist. My contacts with poultrymen and poultry raisers were for the most part the work of the County Agricultural Agent. Meetings are often scheduled as far as a month in advance and are given publicity through the county papers and by letter or post-cards to poultry raisers in the area. Many times, due to weather conditions, crop planting, failure to give the meeting publicity, or competition with other meetings, I have had four or six people present after having driven one hundred or more miles to place of the meeting. It occurred to me early that if the almost 163,000 poultry raisers were to derive much benefit from my project, I would need to develop nuclei of poultry disease information in the various counties.

Many plans have been attempted in a score of years to bring to the poultry industry the same type of skilled veterinary service available to other branches of animal husbandry. But on the whole veterinarians have remained indifferent to the poultry field and poultry raisers have been stubbornly reluctant to forego the rosy promises of remedy salesmen. Meanwhile the loss from disease in the poultry industry has quadrupled and the percentage of failures has led every other branch of animal production. Doctor Weisner, following rather closely a plan tried with but moderate success in Illinois, appears to be at one and the same time interesting the veterinarians of his state in poultry practice and in some measure convincing Michigan poultry raisers of their need for the benefits of scientific medicine.

The practicing veterinarian was the logical person to whom I could turn. His basic training in animal diseases could easily be broadened to include diseases of poultry. Actually the histopathology of poultry diseases does not differ greatly from that observed in other classes of livestock.

Believing that the average practitioner makes at least five farm calls daily it was logical to assume that poultry would be kept on at least three of these five farms. A goodly number of these flocks will have diseased birds that are a cause of worry to the owner. If the veterinarian can diagnose the disease readily, or send some of the birds to the laboratory, these poultry raisers will be given the correct recommendations and treatment to properly combat the disease or condition present. Too, the client will have more confidence in the treatment prescribed for the animal or animals that caused him to seek help. With this thought in mind I circularized the entire group of practicing veterinarians in the State.

In addition, briefly explaining the need for information in poultry diseases by veterinarians, I asked for suggestions on how this information should be disseminated. Approximately seventy replies were received from this initial contact. A few replies took me to task as this approach and recognition of the veterinary practitioner was a new experience. Fortunately, by far the greatest number were strongly in favor of receiving instruction in poultry management and diseases irrespective of the methods employed.

Several meetings with veterinarians were held early in the spring of 1938 in Lenawee County on invitation from the County Agricultural Agent. The group in attendance at these meetings were instrumental in having the information they had received given to a larger group through Southern Michigan, members of the Whitney Veterinary Club.

Despite the assurance that the need had been expressed I did not feel at ease during

the first several meetings before the regular schools were organized last fall. You undoubtedly have had patients that you knew needed a certain line of treatment, but you were reluctant to suggest it because you did or did not know your client too well.

Finally, last September, I was asked to teach a group of veterinarians the rapid whole blood stained antigen test for pullorum disease. This group of men sponsored by Drs. C. H. Hays and W. H. Beck developed into the first Continuation School for Veterinarians in Poultry Diseases in Michigan. Much credit for the success of the Schools is due these men.

Meetings were arranged at two week intervals and an entire evening given to the topic assigned. The subject matter for the Schools was outlined to include poultry husbandry somewhat beyond the scope of disease, and care was taken that these were included in our studies. The topics covered at the various meetings included: Poultry Anatomy and Physiology; Principles of Feeding; Respiratory Diseases of Poultry; Bacterial Diseases; Virus Diseases; Parasites of Poultry; Seasonal Diseases and Disease Clinics.

Mimeograph sheets covering the main subjects were distributed and on occasion read in class and elaborated upon. Despite the apparent limits of the topics named the post-mortem examination of birds brought to the schools made it possible to include, embryology, incubator sanitation, brooding practices, housing and other factors that bear on successful poultry raising.

The request for a second school was soon received and established. This group was divided to reduce driving distances and finally a fourth was begun for a group in western Michigan. No attempt was made to conform to state lines and the majority of the men attending the second school came from Ohio. After this school was divided and the third school was developed a good representation was recruited from Indiana.

In my correspondence pertaining to poultry diseases, I have never been hesitant in referring to the local veterinarian as I have always respected his ability. Since the schools it is a distinct pleasure to list the names of several veterinarians in my reply. There has been a noticeable change in the consignments received at the laboratory. Many are sent in by the veterinarian or the letter states that this consignment was sent on the recommendation of the local veterinarian.

I have but one thought in this regard that I offer as a caution. I hope that on the strength of my harping on the benefits of laboratory diagnosis that the veterinarian does not lose his confidence in diagnosing poultry disease; a tentative diagnosis, at least should be given and birds sent to the laboratory if there is any doubt following field autopsy and microscopic examination for protozoan parasites.

We are always pleased to collaborate with the veterinarian in diagnosing poultry diseases and aid in any way possible in making accurate diagnoses. Many veterinarians have found it advantageous to bring the client along when he felt the laboratory confirmation of his diagnosis was essential. In many instances the psychological effect on these poultry raisers has greatly benefited the practitioner in his home community.

Since these schools have met there is a noticeable reduction in the number of partially autopsied and highly decomposed consignments of birds received at the laboratory; increasing the efficiency of laboratory procedure and as well the percentage of definite diagnoses.

It is interesting and bears mention that not one consignment of chicks showing pullorum disease has been received from an area in which veterinarians did the blood testing for the hatcheries co-operating with the Bureau of Animal Industry in their tuberculosis control work.

I hope that the request for schools this fall will extend to all portions of Michigan and that following the poultry disease information we may expand to include timely topics on other classes of livestock as was begun late this spring. I have the assurance of the Director of Extension that we can draw on all the talent the College has available that we believe has a message for the veterinarian.

Hydrogen Peroxide as a General Anthelmintic for Dogs

By LEON F. WHITNEY, Auburn, Alabama
Class of '40, Alabama Polytechnic Institute

JUDGING from an investigation of the literature on the various uses of hydrogen peroxide, the credit for being the first and only investigators to attempt to use it as an anthelmintic is due to Schwartz and Porter[1] (1938) of the United States Department of Agriculture. Before them, Butz and LaLande[2] (1934) had determined the toxic effects of the chemical on *Ascaris lumbricoides* in vitro, and concluded that it was highly toxic even in weak dilutions. Goodman[3] (1910) showed that the effects of ingesting a 1% solution were physiologically negligible in the case of a human. Culmer, Atkinson and Ivy[4] (1937), studying the effects of H_2O_2 on gastric acidity in humans and dogs, used dilutions of from 0.5% to 3.0% and concluded that some irritation to the gastric mucosa resulted in proportion to the amount and concentration given.

For several years the author has been trying to find a gas which could be introduced rectally which would quickly traverse the intestinal tract and especially the cecum in dogs, to kill whipworms, for which we have as yet no efficient method of treatment. Upon learning of the limited success obtained by the use of hydrogen peroxide (Schwartz and Porter), chiefly because the dogs vomited it so quickly, and learning also that apparently it was the nascent oxygen which was the killing agent, it was determined to attempt to introduce the hydrogen peroxide rectally, and let the gas be generated within the dog, hoping that it would have the desired effect.

A hound, showing ova of whipworms in his feces, was starved 24 hours and given 16 ounces of a 1½% solution. For two days afterward he dropped ascarids and hookworms. Although no whipworms were recovered from the feces, subsequent fecal examinations failed to disclose any ova and when the dog was destroyed and autopsied, the cecum was found to be free of whipworms, as was the rest of the intestine; in fact, no parasites of any kind were found. These results were so promising that it was decided to conduct a series of tests, using varying quantities and strengths of H_2O_2, in order to determine its efficacy in the eradication of whipworms as well as hookworms and roundworms.

Schwartz and Porter gave six young puppies and three grown dogs, per os, only 2oz per dog, restrained them for 15 to 20 minutes, and then allowed them to vomit. They found that H_2O_2 was from 0 to 100% effective against hookworms, 16.7 to 100% effective against roundworms and ineffective against tapeworms. The author, naturally, did not expect to find H_2O_2 effective against tapeworms, but hoped that by rectal introduction it or the nascent oxygen might work into the cecum and kill whipworms.

Experiment

The equipment consisted of a graduated glass container with a six-foot rubber tube connected to its lower end. Into the other end of the tube was inserted a glass tube two inches long, for stiffness. The solution was administered under slight pressure.

Two wire-bottom cages were used under which was placed clean paper, when the treated dogs were placed in them. A pan with screen bottom was used to wash the feces and vomited material. Aside from the usual dissecting scissors and scalpel, a pair

[1] B. Schwartz and D. A. Porter, 1938. *Revista de Medicina Tropical y Parasitologia*, 3:11-24.
[2] L. W. Butz and W. A. LaLande, Jr., 1934. *J. Am. Pharm. Assoc.*, 23:1088-1094.
[3] E. H. Goodman, 1910. *Penna. Med. Journ.*, 13:339-342.
[4] C. U. Culmer, A. J. Atkinson and A. C. Ivy, 1937. *Am. Journ. Digestive Diseases and Nutrition*, 4:219-223.

of fine pointed forceps to pick up the worms, and containers in which they were stored after being counted, constituted all the necessary equipment.

Dogs were obtained from the Columbus, Georgia, pound. They were given fecal examinations immediately upon arrival. The degree of infestation was marked on the card for each dog and designated by from one to four x's. A dog with a mild infection, which might correspond to from one to five hookworms, was given one x, while a dog harboring perhaps 50 or more was given four x's. The whipworm scale was different; xxxx might represent 12 or more. Tapeworms were noted by the presence of segments on the stool. Some of these were not discovered the first day. The roundworm scale corresponded approximately to hookworms. The system was very inexact, and in fact there would seem to be no point to being exact. It was only necessary to determine whether the dog was infected; and the number of worms recovered was the best indication of the efficacy of the treatment. The reason for making fecal examinations at all with the group of dogs to be sacrificed was to weed out the negative cases in order to save time and material.

Another group of dogs, comprising valuable animals, was used. These were examined by microscopic study of stool samples and treated. A week or more later they were examined again and upon the evidence of these fecal examinations the efficacy of the treatment was judged. Such evidence is not as good as the actual recovery of the parasites, sacrifice of the animal and study of the gastrointestinal tract, but it is indicative and hence is included in the data in a separate table (Table II).

The treatments were started by giving doses of varying amounts, attempting to grade them according to the size of the dog. It was not long, however, before it became apparent that when this method was employed the effects were only partial. The lower part of the intestinal tract was irrigated and parasites were destroyed, but the duodenum and upper part of the jejunum was not always irrigated. The idea of giving definite dosages for dogs of different sizes was therefore abandoned, and each dog was given all it would hold. When the H_2O_2 stopped running out of the container, the clamp on the tube was snapped shut, the tube withdrawn from the anus, and the anus held as tightly shut as possible until the dog vomited. Gas and liquid escaped in small quantities in nearly all cases but this escape was inconsequential. Massage just behind the ribs facilitated the upward flow of the liquid. Loud rumblings were gener-

Dogs were obtained from city dog pounds, their infestation with whipworms, hookworms, ascarids and tapeworms demonstrated by fecal examination. They were given rectal injections of solutions of hydrogen peroxide as dilute as 1.5%. The injections were continued until emesis occurred. Large numbers of intestinal helminths were recovered from the vomitus and from the feces ejected for several hours. After 24 to 48 hours, autopsies were held and the parasites still present in the intestinal canal counted. In many instances there were none; in others only a few intestinal parasites left in the animal. The remarkable efficiency of the treatment is shown in Table I. The treatment was then used on valuable dogs, and its efficiency as judged by the number of parasites removed and subsequent worm-egg counts in the feces was equally high. This therapy, which was undertaken by the author in the hope that it might dislodge whipworms from the cecum, surprisingly turned out to be effective for all internal worms of dogs including tapeworms.

ally heard just before the dog vomited. As soon as vomiting occurred the dog was released and allowed to defecate and vomit as it pleased.

Holding the dogs in various attitudes while the hydrogen peroxide was introduced was tried. Some were held with heads down, some were held on their backs, some on their sides. Some were held first in one position and then in another. It was found that the standing position produced as rapid results as any.

TABLE I—Details of Treatment, Worm Count and Autopsy

Dog	Wgt. lbs.	Hours Fasted	Treatment to Autopsy	Dose Ozs.	Percent H_2O_2	Time to Vomition	Species concerned	Fecal Exam Result	Worms Recovered	Worms in Dog	% Recovered
1	47	36	7 days	16	1.5	.....	Whipworm	xx	.....	.....	100
							Roundworm	xx	.....	.....	100
2	50	4	7 days	16	1.5	.....	Hookworm	xx	.....	6	75
							Whipworm	xx	.....	.....	100
3	80	10	2 days	16	1.5	.....	Hookworm	xxxx	45	47	48
							Tapeworm	.....	23	.....	100
4	30	10	24 hrs.	8	1.5	.....	Hookworm	xxx	.....	6	? *
							Whipworm	.....	.....	2	? *
5	15	24	24 hrs.	6	1.5	5 min.	Hookworm	xxx	45	.....	100
							Whipworm	xxx	3	.....	100
6	42	24	24 hrs.	20	3.0	4 min.	Hookworm	xx	3	.....	100
							Roundworm	x	2	.....	100
7	25	24	28 hrs.	2	1.5	.....	Tapeworm	.....	12	.....	100
							Hookworm	xxx	23	.....	100
							Roundworm	xx	5	.....	100
							Tapeworm	.....	8	.....	100
8	40	12	20 hrs.	8	1.5	.....	Hookworm	xxxx	33	67	33
9	5	24	23 hrs.	8	1.5	5 min.	Hookworm	x	5	.....	100
10	35	2	23 hrs.	24	1.5	.....	Hookworm	xx	5	8	38
11	22	24	24 hrs.	7	1.5	3 min.	Hookworm	xxx	5	.....	100
12	20	28	24 hrs.	8	1.5	.....	Hookworm	x	3	.....	100
							Whipworm	xx	.....	3**	100
13	35	28	24 hrs.	16	1.5	3 min.	Hookworm	xx	7	.....	100
14	40	24	7 days	16	6.0	3 min.	Hookworm	xx	9	.....	100
							Roundworm	x	2	.....	100
15	23	24	24 hrs.	8	1.5	5 min.	Hookworm	x	6	.....	100
							Roundworm	x	1	.....	100
16	12	24	24 hrs.	7	3.0	8 min.	Tapeworm	.....	35	.....	100
							Hookworm	xx	12	.....	100
							Roundworm	x	2	.....	100
17	18	10	30 min.	14	1.5	6 min.	Hookworm	xx	10	2‡	100
18	13	36	27 hrs.	5	1.5	8 min.	Hookworm	xxx	22	.....	100
							Roundworm	xx	5	.....	100
							Tapeworm	.....	62	.....	100
19	25	24	24 hrs.	8	3.0	8 min.	Roundworm	x	1‡‡	.....	100
							Hookworm	xx	.....	.....	100
20	12	15	24 hrs.	8	1.5	10 min.	Hookworm	xx	8	.....	100
21	20	15	24 hrs.	12	3.0	10 min.	Hookworm	xx	.....	.....	100‡*
22	40	24	20 hrs.	12	6.0	.....	Hookworm	x	3	.....	100
							Whipworm	.....	1	.....	100
23	12	21	27 hrs.	5	1.5	25 min.	Hookworm	x	4	.....	100
							Whipworm	x	3	.....	100
24	13	21	3 hrs.	5	1.5	7 min.	Hookworm	x	8	.....	100
							Whipworm	xx	.....	9‡**	.....
25	10	24	24 hrs.	5	1.5	7 min.	Hookworm	xx	.....	.....	100
26	30	12	24 hrs.	12	1.5	.....	Hookworm	xxxx	81	6***	92
27	30	12	24 hrs.	16	1.5	.....	Tapeworm	.....	1	.....	100
							Hookworm	x	8	1	88
28	2	7	14 hrs.	2	1.5	3 min.	Roundworm	xxx	40	.....	100
29	22	12	24 hrs.	12	1.5	2 min.	Hookworm	xx	11	.....	100
							Tapeworm	.....	3	.....	100
30	50	12	24 hrs.	17	1.5	.....	Hookworm	xxx	58	7*‡**	92
							Whipworm	x	1	1*‡**	.....

Notes—*Constipated. **Dead in cecum. ‡All unattached and dead. ‡‡In vomit; no attempt made to find hooks. ‡*No attempt to find hooks. ‡**Two attached and seven loose in cecum. No attempt to recover. *** All in duodenum. *‡*Hookworms in duodenum; whipworm unattached in cecum.

Both warm and cold solutions were tried, the temperatures varying from 50 to 100°F. The warm solutions seemed to reach the stomach more rapidly than the cold.

Various strengths of solution were tried, ranging from 1.5 to 6.0%. Five pounds of 30% H_2O_2 were procured and dilutions were made as desired. This proved to be a much more economical method than purchasing the ordinary 3% U.S.P. commercial material and diluting it.

Administration of apomorphine hydrochloride to induce vomiting just before the fluid reached the stomach seemed to help, but due to the intermittent effect of the drug with a considerable lapse of time after the first retching, it was no more effective than insertion of a few ounces of the H_2O_2

TABLE II—Details of Treatment and Fecal Examinations

Dog	Wgt. Lbs.	Dose Ozs.	Vomit?	Species concerned	First Fecal Exam.	Subseq. Fecal Exam.	Percent Successful
B1	45	16	Yes	Hookworm	xxx	.....	100
				Roundworm	x	.....	100
B2	25	8	Yes	Hookworm	xx	.....	100
B3	12	5	Yes	Hookworm	xx	.....	100
				Roundworm	x	.....	100
B4	45	22	No	Hookworm	xxx	.....	100
				Whipworm	x	.....	100
				Tapeworm	.....	.....	100
B5	55	20	Yes	Hookworm	xx	.....	100
				Whipworm	xx	x	75
				Tapeworm	.....	.....	100
B6	40	14	No	Hookworm	xx	.....	100
				Whipworm	x	.....	100
				Tapeworm	.....	.....	100
B7	60	16	Yes	Hookworm	x	.....	100
				Whipworm	xx	.....	100
				Tapeworm	.....	.....	100
B8	52	16	No	Hookworm	xxx	x	80
				Whipworm	x	.....	100
				Tapeworm	.....	.....	100
B9	40	16	No	Hookworm	xxx	x	80
				Tapeworm	.....	.....	100
B10	35	12	Yes	Hookworm	xx	.....	100
B11	30	10	Yes	Roundworm	x	.....	100
				Hookworm	x	.....	100
B12	45	16	No	Whipworm	xx	.....	100
				Hookworm	x	.....	100
B13	22	6	No	Whipworm	x	.....	100
				Hookworm	x	.....	100
B14	46	22	Yes	Roundworm	xxx	.....	100
				Hookworm	xx	.....	100
B15	17	6	Yes	Hookworm	xx	.....	100
B16	53	18	Yes	Roundworm	xx	.....	100
				Hookworm	x	.....	100
B17	20	5	Yes	Whipworm	x	.....	100
				Hookworm	x	.....	100
B18	60	30	Yes	Whipworm	x	.....	100
				Hookworm	x	.....	100
				Tapeworm	.....	.....	100
B19	90	30	No	Hookworm	xx	.....	100
B20	75	20	No	Hookworm	x	x	.....
B21	74	20	No	Hookworm	xx	x	50
B22	85	24	No	Hookworm	x	.....	100

solution with a stomach tube directly into the stomach.

Some dogs were given a second treatment half an hour after the first, but this seemed unnecessarily severe.

The effect of the treatment on young puppies and old dogs was noted carefully, as was the effect on the gastric and intestinal mucosa of all dogs on which autopsies were held. Some dogs were sacrificed within a few minutes after treatment to determine the rapidity of action, and others destroyed at varying times up to two days. The majority were killed about 24 hours after treatment. The tables show the results. The success of the method must be judged by those animals which received a complete treatment and not by those partially treated, because it is patent that a dog which has not vomited has not had his entire gastrointestinal tract irrigated. Despite this fact, several dogs which did not vomit were entirely rid of parasites. But those which were not completely cleared of them, possessed them only in the upper part of the intestinal tract. It is notable, however, that in every case the tapeworms were all eliminated. Dog No. 3 is a good example of that. He was a large German Shepherd. Only 16 ounces were administered. He chewed out of his cage and escaped within 12 hours after having been dosed, leaving behind 23 complete tapeworms and 45 hookworms. When he was found and a necropsy held two days later he was free of tapeworms, although he still had 47 hookworms, all in the upper six feet of his intestine.

No noticeable bad effects were observed, aside from the temporary discomfort to the dog of the gas pressure and of the retching, which was usually not severe. No other pain was apparent. Generally an assistant was required to hold the animal for the operator to administer the solution. The dogs became passive quickly. There was usually blanching of the gums, and in a few cases, paralysis of the pelvic limbs, which can be accounted for on the basis

of internal pressure. These, however, were not alarming nor painful, both conditions passing shortly. The paralysis generally occurred in puppies and in emaciated young dogs and did not affect the older animals in good health.

Two dogs, a fox terrier and an English setter, were treated three times each with a 1.5% solution at weekly intervals. They showed no bad effects, and have continued to put on weight, the usual result of being freed of hookworms.

Effect on Gastric and Intestinal Mucosa

The mucosa of the entire tract was examined as carefully for irritation as it was for hookworms. But it was practically out of the question to say whether the congested areas found were the result of the douching or of something else. Nearly all of the dogs used had been roaming the streets before they were picked up by the dog warden. Large and small reddened areas were found in many of them. It was, therefore, decided to sacrifice some of the dogs which were found negative on fecal examinations. Autopsies were performed on two of these dogs and on two treated dogs on the same day. The treated ones had received a douching with a 3% solution 24 hours before; the controls had received no treatment. The autopsy revealed clean mucosa with no apparent congestion in the treated animals, while the two controls showed in one case great dark reddened areas, especially in the colon and lower ilium, and in the other a distinct light reddening throughout the entire small intestine.

Probably the best evidence as to whether the douches are irritating is the fact that so many different kinds of discolored patches were found in these street dogs. If the douching caused irritation one would expect to find some uniformity of reddening, but such was not the case. In many cases the mucosa has been as clean and pink as that of any normal dog.

Several persons accustomed to observing intestinal mucosa at autopsies have observed the test animals. They stated that they could see no evidences of damage, and that in observing the mucosa of any series of street dogs, a high percentage of injured and irritated intestines is to be expected.

Still another point is the fact that the dogs were ready for food as usual at meal time, provided meal time came after the first effects of the douching had worn off. This applied to dogs douched with 6.0% H_2O_2, as well as those douched with weaker solutions. The mucosa of those douched with the 6% did not appear to be harmed, when examined several days later.

Discussion

In considering the data certain facts are apparent. The concentration of H_2O_2 used varied from 1.5% to 6% and apparently no harm resulted from any of these doses, but the 1.5% did as thorough a job in removing the several types of parasites as did the higher concentrations. Therefore, it would seem unnecessary to administer the stronger dosages, both because of the unnecessary expense and to spare the dog possible irritation of his intestinal lining.

It would seem best to introduce as much of the solution as possible, as quickly as possible. In several cases where it was allowed to run in very slowly, the liberated oxygen ballooned the intestines so much that the pressure prevented the maximum quantity of solution from entering. It also seems better to use a warm solution because the dog seems to take it with less discomfort and vomits more rapidly, indicating that the solution has traversed the length of the intestinal tract more quickly.

The failures could be accounted for in almost every instance on the basis of the failure of the solution to irrigate the upper part of the tract, or in the cases where the dogs were constipated. In one case where whipworms were found still attached in the tip of the cecum, there was a hard lump of fecal matter in the cecum. In another when nine were found and two still attached only three hours after treatment, the cecum was filled with feces and was of a very unusual type, having a double twist in it instead of the normal single twist. In

such cases it would seem appropriate to starve a dog, say for 36 hours, then feed and then inject a stronger solution, say 4 to 6%, giving it warm and quickly and allowing the dog its freedom in two or three minutes.

As to the cost of the treatment, it is very small—even less than the use of the combination of tetrachlorethylene and arecoline hydrobromide. The cost may best be judged by first noting that the dose of 1.5% solution ran from two to 32 ounces for the dogs treated. The following table gives the approximate amount of a warm 1.5% solution which dogs of these weights may be expected to require. There are variations to be sure, and it is always better to have a few extra ounces in the container, but this need not be wasted if not used.

If the veterinarian purchases hydrogen peroxide from a wholesale drug house, in the 30% strength, and dilutes it to the required percentage solution, it will be much the cheapest way to purchase it. The costs are figured on the price of $1.50 per pound for 30%, purchased in 5 pound lots. One pound of 30% will make 20 pounds of 1.5% solution. Thus 320 ounces costs about $1.50 or slightly under one-half cent per ounce.

Weight of dog (lbs.)	Amount H_2O_2 required (ozs.)	Cost (cts.)
2	1½	1
5	3	2
10	5	3
15	7	4
20	9	5
30	12	6
40	17	8
50	20	10
60	24	12
70	28	14
80	32	16

Dogs which were not fasted did not respond as well to the treatment as those which were. It would seem advisable, especially in the case of whipworms, to fast the dog for 36 hours. Several dogs treated had ingested large amounts of fat which they vomited, but no ill effects resulted. There is no need to be particular about the kind of food fed the day before treating, as in the case of tetrachlorethylene, and even though the H_2O_2 is given when the intestines and stomach are full of food, no harm results, but the treatment is inefficient.

Leon F. Whitney

Dogs should be allowed free access to water up until the time of treatment. If the dog has taken a large drink just before treatment, it would be better to postpone treatment until the water has had a chance to be absorbed. In the cases of several dehydrated dogs which were treated it was remarkable that after they were released following treatment, only a small amount of gas was voided, and no liquid. The H_2O_2 decomposes into nothing but H_2O and O_2, and the water is absorbed. Whether or not undecomposed H_2O_2 could be absorbed by a dehydrated dog was not determined.

The flatulence does not last long, and no case of intestinal rupture was observed in this series of dogs.

Starvation may not be enough in the event a dog is badly constipated. Judging from one such dog examined, the cecum contained a hard lump which appeared to fill it after the intestinal tract was virtually empty. A special course of feeding laxative foods for several days may be advisable when a dog has whipworms, so that the cecum will be filled with soft material, if not empty. It was remarkable to the author that despite the fact that many of the dogs treated were practically empty there was some soft fecal material in the cecum in all but a few dogs. Since this treatment

seems to offer the greatest hope of efficiently removing the whipworm, such special precautions are worthwhile.

The best procedure seems to be introduction of a few ounces of H_2O_2 solution into the stomach with a stomach tube to induce vomiting, then quickly starting the treatment. If the dog is not allowed to vomit for a few minutes, and then is given his freedom to do so, the retching of the dog appears to help the upward movement of the rectally introduced solution and a thorough job is done in the quickest manner with least discomfort to the dog. Some of the solution in the stomach passes out of the pylorus, as Schwartz and Porter found, and destroys some worms in the upper part of the jejunum, and with the heavier dose moving upward to the stomach there is thorough irrigation. It must not be assumed, however, that because a dog is nauseated from the H_2O_2 in the stomach that the material has already reached the stomach from below. This point can be determined by the additional quantity of solution and froth vomited.

It was encouraging to find that the solution was so very toxic to tapeworms. These appeared to be the most quickly removed of any of the parasites, and such an effect was not expected in view of the opposite result found by Schwartz and Porter. It would seem that their results could be explained by the fact that so much of the material they introduced was vomited. They used only a fraction of the amount we used, so very little actually found its way into the intestines. The tapeworms recovered had the heads attached and came away as units.

The author gratefully acknowledges the suggestions of Dr. Dale A. Porter during the progress of this study. It was the reading of the paper by Schwartz and Porter that occasioned this study. It is only logical that these results should have been accomplished by the large amounts used, when even small amounts produced promising results in some instances for the investigators mentioned above.

Thanks are also given to the members of the faculty of the School of Veterinary Medicine of the Alabama Polytechnic Institute for their kindnesses and suggestions, and also to H. G. Young and Earl Turner, two fellow students, for valued coöperation.

Summary

The introduction per rectum of warm 1.5% solutions of hydrogen peroxide was found to be highly efficient against the common dog tapeworm, *Dipylidium caninum,* the roundworms, *Toxocara canis* and *Toxascaris leonina,* the hookworm, *Ancylostoma caninum,* and the whipworm, *Trichuris vulpis.* Stronger solutions were unnecessary.

It would appear that in this treatment an anthelmintic is available which will remove the four principal intestinal parasites of dogs. During administration there is temporary discomfort to the dog due to the gas pressure from the decomposition of the H_2O_2 into H_2O and O_2, but this soon passes.

No intestinal damage which could be attributed to the treatment was observed in 30 dogs on which autopsies were performed. The dogs were ready for their next meal as usual and no anorexia was noted on the following days.*

Success of treatment depends upon the following factors: adequate fasting until digestive tract is empty; freedom from constipation; continuation of passage of solution under slight pressure and restraint of dog until he vomits.

Introduction of hydrogen peroxide into the stomach by a stomach tube just before rectal injection was begun appeared to help to reduce the time required for complete irrigation and to make the treatment completely effective.

*Some results obtained in treating individual dogs since completing this study indicate that in some cases the treatment may have an ill effect. The administration of 24cc of 1.5% solution to a bloodhound bitch pregnant six weeks made breathing very difficult for her for about 10 minutes, although no harm resulted in this case. Two Boston terriers given the treatment did not vomit; both refused to eat for two days, and considerable blood was passed in their feces. It appears possible that the treatment is contraindicated for animals in which, because of their breed or special conditions present, little expansion of the abdomen is possible. Another contraindication may be found in the presence of gastric or intestinal ulcers; no dogs having such ulcers have been treated to date. Further investigation will be necessary to determine precisely all the conditions under which treatment is contraindicated; it can be said with some assurance, however, that for most breeds under most conditions the treatment is as safe as it is efficacious. A number of highly-bred, valuable dogs have been treated with complete success.

Rabies

By B. M. LYON,
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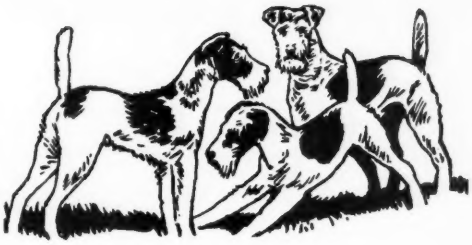

History

NO DISEASE of man or animals has a more interesting historic background than has rabies. It is one of the earliest recognized infectious diseases. A fatal case of canine rabies was recorded as early as 1300 B.C. In 300 B.C., Aristotle described the disease, stating: "Dogs suffer from madness; it throws them into a state of fury, and all animals which are bitten are also attacked with madness." In the first century of the Christian era it was described as a disease of animals transmitted by biting, and the warning was given that the bite should be well bathed and burned with a hot iron, since after symptoms developed, death always followed.

Many hundred years passed before anything was added to our knowledge of the disease, though writings on the subject were many. It was not until 1880 that Pasteur determined that the disease may be prevented by administering gradually increasing doses of the virus to an infected person or animal. In 1903, Negri discovered specific bodies within the protoplasm of the nerve cells. This discovery made possible a rapid microscopic diagnosis.

Among the many early references, we find a widely varied nomenclature, a great number of fallacies and superstitions, which still exist among the laity, to a greater extent than surrounds any other known disease.

Distribution

The distribution of rabies is world wide. No state in the United States is free from the disease, and no country, with the exception of England, Australia and the Scandinavian countries is unaffected. These countries, because of their favorable geographical positions and enforcement of strict quarantine, have been able to exclude the disease for many years. The United States is not so favorably situated.

Statistics as published by various state boards of health indicate that rabies in many states is prevalent to an alarming extent. These same statistics show that over the past 10 years the disease has claimed from 50 to 100 human lives annually, and in addition, thousands of exposed persons are subjected to treatment. In addition to the public health problem the annual loss of domestic live stock demands a vigorous control program.

Susceptibility

All mammals which have thus far been experimentally infected, as well as fowl, have proved susceptible to the disease. Cold-blooded animals, such as reptiles, are believed to be the only species which resist infection. While we think primarily of the dog as chiefly incriminated in the transmission of rabies to man, many other species are capable of transmitting the virus. In some areas, the disease is prevalent among the skunk, gopher, coyote, fox and wolf, and epizoötics have been traced to such sources.

Etiology

Rabies is classified etiologically as belonging to that group of diseases of which we have some 30 in animals and 38 in humans, caused by filterable viruses, disease-producing agents which pass the finest filters, have not been isolated or microscopically demonstrated, and can be propagated only upon living tissue.

The rabies virus is relatively stable. Brain tissue suspension is little affected by cold

*Presented at the 38th annual meeting of the North Carolina State Veterinary Medical Association, June 28, 1939.

and slowly affected by putrefaction. Brains of dogs buried for weeks have proved infective. The same tissue virus may remain active for months on buffered glycerin. It is destroyed by heating at 58°C. for 30 minutes, by 5% phenol in 30 minutes, or by 1% formalin or 1:1,000 bichloride of mercury solution for 15 minutes.

Transmission

The virus may be demonstrated in the saliva of rabid animals and the disease is most commonly associated with the introduction of the virus-laden saliva by a bite. However, the virus may be introduced by licking of fresh skin abrasions. Evidence has been presented to show that the saliva may be infectious as early as eight or 10 days prior to the development of symptoms. It is therefore evident that all bites, especially from dogs or cats, must be regarded with suspicion until proved negative.

Milk from rabid animals may contain the virus, yet there is no conclusive evidence that the disease may be transmitted from ingestion of such milk. In fact, there is much evidence to the contrary. Offspring nursing such mothers have been known to develop the disease, but it was concluded that infection was acquired by other means, such as licking, etc., rather than by ingestion. The virus has been fed without producing the disease, and it is assumed that a normal digestive tract destroys it. Meat from rabid animals is condemned by inspection regulations.

Until recently, the virus-carrier state in rabies has not been recognized. It has been generally considered that active virus was transmitted only during or immediately before the active stage of the disease. However, in the study of rabies in cattle in Trinidad, Pawan observed that healthy bats may harbor the virus and transmit the disease for months. Also, Leach, while using the mouse diagnostic tests on specimens from dogs suffering from indefinite ailments, and in which Negri bodies could not be demonstrated, recovered the rabies virus. Webster reported recovering virus from apparently normal skunks. The possibility of a virus reservoir or carrier may thus complicate our previous theories of the disease transmission.

An interesting incident of rabies transmission was recently reported in New Jersey. A bitch nursing seven puppies had been exposed to rabies and, it was learned later, had died of the disease. In the meantime, the seven puppies had been given to seven different families. Following investigation, it was reported that every one of the seven puppies developed the disease within a few days of the same incubation period. As a result, approximately 100 persons were obliged to take the rabies treatment. The method of transmission to the puppies was not demonstrable.

Incubation

The wide range of variability in the incubation period of rabies does much to complicate control measures. In dogs, the average period from exposure to development of symptoms is from 20 to 40 days. The earliest period at which the disease may appear is 10 to 12 days, whereas some dogs may not show symptoms for several months. Incubation periods of a year or more have been reported, but these are questionable on a basis of possible reinfection.

There are many factors to which the length of incubation may be attributed, such as: virulence and amount of invading virus; individual susceptibility; age of the subject, younger animals in general being more susceptible; extent of the bite injury, and proximity to the central nervous system.

Symptoms

The symptoms of rabies are familiar to veterinarians, and it is unnecessary to list them here. The syndrome induced by this neurotropic virus as it attacks the central nervous system is varied in character by the virulence of the invading virus, the susceptibility of the host, and the species attacked.

Diagnosis

Clinical.—The importance of securing full clinical data cannot be overemphasized. It is, therefore, important that we avoid early destruction of the animal suspected

of rabies, placing it in confinement under the observation of a qualified veterinarian. Early destruction likewise frequently precludes the possibility of finding evidence of rabies microscopically by the presence of Negri bodies, since they may be few in number, or not yet fully developed.

Microscopic.—When sufficient clinical evidence has been collected by the veterinarian, it is preferable to destroy the dog in order to avoid possible brain decomposition following death. Negri bodies are more difficult to demonstrate after cellular decomposition.

Having been in direct contact with rabies laboratory diagnostic service for many years, I should like to emphasize the importance of, or rather justify, the guarded diagnosis frequently given by laboratories following a negative microscopic finding. Demonstration of the well-developed Negri bodies within the nerve cell protoplasm is sufficient evidence upon which to base a positive diagnosis. Failure to find such bodies, however, is not sufficient evidence upon which to make a negative diagnosis. A negative microscopic finding, with a suspected history, should be reported with reservations, or regarded as doubtful until confirmed by animal inoculation. Our laboratories check all microscopic findings, both negative and positive, by animal inoculations.

Animal Inoculation. — Fortunately, we have a final test, animal inoculation, by which we may prove or disprove our judgment of both the clinical evidence and the microscopic findings. True, such a test requires considerable time, but thanks to Drs. Webster and Dawson, the test has been shortened and may now be completed in seven to 10 days. These investigators, along with other able workers on the subject, showed that young mice from a certain strain of Swiss mice are highly susceptible to rabies virus, and when injected intracerebrally, will show symptoms and paralysis in seven to 10 days, in contrast to a corresponding test in rabbits and guinea pigs requiring 14 to 21 days. Thus, where doubtful microscopical diagnosis may be reported, and treatment of the exposed individual advised, treatment may be discontinued within 10 days, should inoculation tests prove negative.

"Other hounds flee and avoid the wood [rabid] hound as pestilence and venom, and he is always exiled as it were an outlaw, and goeth along wagging and rolling as a drunken beast, and runneth yawning and his tongue hangeth out, and his mouth drivelleth and foameth, and his eyes be overturned and reared, and his ears lie backward, and his tail is wrinkled by the legs and thighs; and though his eyes be open yet he stumbleth and spurneth against everything, and barketh at his own shadow."
—*Barthol. Glanville*, c. 1250 A.D.

Here again it is important that advanced decomposition be avoided if satisfactory inoculation tests are to be conducted. Injection of decomposed brain tissue frequently kills test animals by bacterial infection prior to the possible development of rabies.

Control

Prophylaxis and Treatment.—Since the time of Pasteur, it has been recognized that man and animal may be immunized against rabies. However, after years of scientific study, experimentation and development of immunizing agents, we still have skeptics, faddists and theorists spending time, effort and money, broadcasting their fallacies through the medium of the public press, under the startling headline, "The Rabies Racket." Many such propagandists even deny the very existence of such a disease. Some not only emphasize the suffering resulting from vaccination, but even claim the actual spread of the disease by such measures.

The evidence frequently cited in such articles is based upon an occasional individual failure of protection, an occasional abscess, an individual post-vaccinational

paralysis. No product, even the most effective and generally accepted immunizing agent used in human medicine, is 100% efficient. However, such failures and unfortunate incidents have been so few and insignificant in comparison to the benefits derived that they do not reflect adversely upon the general acceptance and use of rabies vaccine in human medicine.

Such is the case with canine rabies prophylactic vaccination. If we are to accept an occasional individual failure or a rare unfortunate incident as the criterion upon which to base the value of the product, then we are indeed unfair. The value of annual canine prophylactic vaccination has been repeatedly demonstrated as measured by the reduced incidence of the disease in communities where vaccination has been systematically conducted in conjunction with elimination of the stray and unlicensed dog.

A review of the scientific literature over the past few years, discloses records of many immunological studies and experiments on rabies. These records show that the canine prophylactic vaccine, single-injection method, was first introduced and generally accepted by the Japanese prior to 1920. A marked reduction in the incidence of the disease was noted following its adoption. In an interview this spring with two prominent Japanese medical scientists visiting the United States, I was advised by them that this method is still in general use in their country, with favorable results.

In 1922, after two years of investigation by Dr. Eichhorn and the writer of the Lederle Laboratories, in which the Japanese claims were mainly substantiated, the vaccine was introduced in the United States by our laboratories. Since this time, various investigators have reported the results of immunological tests, some showing absolute and definite protection, others partial, and still others little or no protection.

The explanation of such discrepancies in results obtained may be variously explained. First of all, the measure of protection must be judged in terms of the degree, amount, and method of infection, in comparison to the natural mode of acquired infection. Many experiments were conducted with too little regard for the severity of the experimental virus exposure in comparison with the naturally acquired infection. Likewise, many different vaccines were used, as well as varied technic in conducting such tests, which also may account for variations in results by different investigators.

The fact remains that a measure of protection may be obtained by the canine prophylactic single-injection treatment. Several municipalities and districts, including military reservations, where it has been possible to secure general systematic annual vaccination for a period, have provided evidence of this fact, as shown by a reduced incidence of rabies. Difficulty has been encountered in securing compulsory legislation, and when secured to have it extend to sufficient areas to prevent the invasion of stray animals from territories beyond the restricted region.

As previously stated, an occasional failure of protection has occurred. Such failures have resulted in support among authorities for a two-dose prophylactic treatment to replace the single-dose method. It is quite generally agreed among immunologists that such a procedure may be justified in view of the added protection which it gives. In accord with our general knowledge of other immunological procedures, after the basic immunity is established by the initial injection, a second dose at a proper interval, not only may materially increase the protection resulting from the initial stimulus, but may multiply it manyfold.

It is also proposed by some investigators that having established a high degree of resistance the first year by giving a second or even a third dose, sufficient protection could be retained by a single dose given annually thereafter.

Critics of the single-dose treatment frequently compare it unfavorably with the 14-dose treatment quite universally given exposed human subjects. The facts are that while a single, 5cc dose of canine prophylactic 20% suspension contains one gram

of tissue virus, the 14-dose human treatment (Semple Method) consists of 28cc of a 4% suspension administered 2cc per dose, or 1⅛ gram of tissue virus in the total 14 doses. When considered on a body weight basis, the dog is receiving, for prophylactic immunization, a much larger dose than that given man following exposure. Nevertheless, there is something to be said in favor of the superiority of the multiple dose over the single dose, although the latter be equivalent in size to the sum total of the multiple dosage.

If this two-dose prophylactic treatment were adopted for vaccination of the unexposed dog, the dog would receive approximately twice the tissue virus equivalent of the human treatment. The customary recommendation for the exposed dog of six doses of the canine prophylactic suspension constitutes about five times that given under similar circumstances in case of human exposure.

Vaccine Improvement

Over the past two years, some very valuable studies have been and are still being conducted upon the various phases of rabies immunization and vaccine production. Much of this work has been conducted by Dr. Webster and his coworkers of the Rockefeller Institute.

We have previously referred to the use of the Swiss strain of white mice as a diagnostic test subject whereby doubtful microscopic findings may be confirmed or denied within seven to 10 days with greater accuracy and much saving of time.

A still further application of this highly susceptible strain of Swiss mice has been demonstrated by Webster and his coworkers in the development of a practical test whereby rabies vaccines may be tested for their antigenic or immunizing value. Since the application of this test in evaluating rabies vaccines, a wide variation has been shown in the immunizing value of vaccines. This test now enables manufacturers to evaluate the vaccine prior to distribution, and at the Lederle Laboratories we are making extensive application of this new test in order that we may distribute only vaccines of proved immunizing value.

It has been further shown by Webster that the rabies virus may be propagated upon tissue culture such as the mouse and rabbit embryo brain tissue suspended in a serum tyrode medium. The virus concentration is comparable to that from diseased brain tissue and has been proved antigenic by animal immunization tests when used in an active state and injected intraperitoneally. From a research standpoint, these findings are very interesting. However, the maximum scale of production possible, using mouse or rabbit embryo virus tissue, as well as the use of an active virus for prophylactic immunization on a wide scale, appears impractical and inadequate at present.

In a recent conversation, Doctor Webster expressed loss of interest in the prospect of the tissue culture virus, and is again confining his efforts to determine what factors are responsible for the effectiveness of some rabies vaccines and the ineffectiveness of others; also, what steps are necessary to produce consistently a good vaccine, one which is safe, antigenic, and practical of application.

It is, therefore, evident that our present rabies vaccine is our most valuable and only specific agent for use in the prevention and control of the disease. We also recognize that this vaccine is not perfect, yet when properly prepared, it has been repeatedly shown, both experimentally and under clinical field application, to be antigenic and a valuable aid in the control of rabies.

I should like to emphasize further that it is to a wider application of our present prophylactic vaccine, with the expected improvements therein, and newly developed methods of standardization, that we must look for a more general control of the disease.

* * * *

Dr. Charles C. Rife, Atlanta, Ga., reports the vaccination of an average of 5,000 dogs yearly against rabies. In 13 years experience with rabies vaccine, he has found the single injection method effective in more than 90% of the cases.

Abstracts

Fungicidal Drugs

Baudet[65] has studied the fungicidal effect of various drugs upon *Trichophyton equinum* in the hair of guinea pigs artificially infected with fungus of that species. After having been exposed during various times to the action of the drug concerned, the hairs (more than 800) were washed for a long time in a sterile physiological saline solution, and then transferred to 4% glucose agar, and incubated at 26°C. If a fortnight later no culture had developed on the media, the drug was considered to have killed the Trichophyton. Of the 16 different drugs examined, the best results were obtained with 3% carbolic acid, and 3% formalin, both of which killed the Trichophyton in the hairs after a half hour's exposure. Since in this concentration formalin spreads less odor than carbolic acid, it is to be preferred.

* * * *

Nymphomania in Cows and Mares

Latteur groups nymphomania into three classes[71] as follows: (1) Nymphomania caused by psychic disturbances. Such cases are very rare. When male and female animals are stable mates, there is a possibility that the former may, by their continual sexual desire, excite the latter to the extent that nymphomania will result in a relatively short time. Under such circumstances the heat period continues beyond the normal time, the other phases of the estrus cycle become shorter, and finally a continuous stage of sexual excitement is reached. There is a possibility that the nymphomania seen in complication with rickets has a causal relationship to vitamin deficiency, especially vitamin E deficiency.

(2) Nymphomania caused by hypolutemia. Many mares exhibiting repeated and prolonged estrus often conceive in spite of this condition, but the fetus dies, and ten to twelve weeks later estrus appears again, and then ceases entirely. The explanation is that the hypophysis anterior lobe produces too little gonadotrop hormone. The injection of Prolan-B will overcome this condition.

(3) Nymphomania caused by overproduction of Prolan A. In this class belong most of the nymphomanias seen in cows and mares. On examination they show cysts originating from follicles which have not ruptured. This condition is due to overproduction of the gonadotrop hormone. There is no direct relationship between hypersexuality and the number and size of the ovarian cysts.

* * * *

Magnesium Content of the Blood of Calves

This is one phase of a study undertaken by the authors[75] to determine the requirements of certain elements by dairy cattle. Determinations of magnesium were made on the blood plasma of 107 normal dairy calves at intervals of one to two weeks over a period of three years. Values were calculated for the mean concentration of magnesium in the blood plasma for the first 18 months of life. The mean magnesium values showed fairly close agreement from month to month and a definite tendency to increase up to 12 to 13 months of age. The change in level was accompanied by a series of rhythmic variations which extended over several months. The mean value for all of the observed values was 2.414mg per 100cc of blood plasma (range 1.62-3.83mg), and 79.7% of the values were between 1.895 and 2.795mg; whereas 72.5% of the values actually occurred within the limits established by the band of normality.

It was shown that the concentration of magnesium cannot be regarded as constant. The range of the so-called normal variation is in all probability sufficiently wide to include many variations that occur under pathological as well as physiological conditions since the maximum and mini-

[65] Baudet, E. A. R. F. The Fungicide Effect of Various Drugs. (Transl. title.) *Tijdschr. v. Diergeneesk.* 63:15.
[71] Latteur, J. P. *Ann. de méd. vét.* 83(12):524-532.
[75] Duncan, C. W., C. C. Lightfoot and C. F. Huffman, 1938. The Magnesium Content of the Blood Plasma of the Normal Dairy Calf. *Jnl. of Dairy Sci.*, 21:11, pp. 689-696.

mum values for each month are definitely outside of the limits of the band of normality established for the combined values of the prediction curve. The results of the investigation also make it evident that fluctuations in the plasma magnesium content of the blood of growing dairy calves are to be expected as normal occurrences.

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Survival of Horse Strongyle Larvae in Soil

The burial of horse feces containing strongyle eggs in four types of soil—coarse sand, fine sandy loam, sandy clay loam, and clay—did not prevent development of infective larvæ in the feces.[74] Statistical analysis of the data on larvæ recovered from the surface of the soils showed that migration to the surface was significantly affected by soil type. This factor also appeared to influence the numbers of larvæ persisting in the feces and deeper soil layers a few months after the feces were buried. Increased depth of burial in a given soil clearly reduced the degree of migration of infective larvæ from the feces to the soil surface. Statistical analysis also showed that the effect of depth of burial, independent of soil type, was significant. Depth of burial also appeared to be a factor in determining the development or persistence of larvæ in the feces and deeper soil layers. It is probable that the inverse relationship between depth of burial and amount of migration of larvæ to the surface is in some degree related to the effect of depth of burial on larval development, or survival, or both. Deleterious effect on development of larvæ and on survival of larvæ cannot be differentiated by the data of this investigation. These laboratory results may be altered under actual field conditions, but until field tests have been completed and the practicability of the measure ascertained, plowing under of infested soils is not advocated for the control of horse strongyles.

[74] Lucker, John T., 1938. Vertical Migration, Distribution, and Survival of Infective Horse Strongyle Larvæ Developing in Feces Buried in Different Soils. *Jnl. Agr. Res.* 57:5, pp. 335-348.

Contagious Foot-Rot of Sheep

In contrast to the inflammation of the hoofs of sheep, caused by foot-and-mouth disease, contagious foot-rot, in which the necrosis bacillus plays an all-important rôle, really is a virulent infection.[70] Spirochetes also are accused of participating in the etiology of the disease. The germs causing contagious foot-rot are able to live in moist soil as long as 30 days, in feces and dry soil up to two weeks, but in the diseased parts of the hoof the germs are able to survive up to three years. The incubation period is from 17 to 50 days. The infection is spread not so much by contaminated pastures as by the sheep themselves. The portal of entry is always the hoof. Treatment is mainly surgical. Prophylactically the hoofs should be trimmed at least every six weeks during winter, and again just before putting the sheep on spring pasture. Any sheep showing symptoms of contagious foot-rot must be quarantined and treated.

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Epidemiology of Undulant Fever

Santagostino[72] states that since 1924, when the campaign for the control of brucella abortion in domestic animals was initiated at the Stazione Zooprofilattico di Milano, not a single case of human infection has been recorded from the use of the live vaccine prepared there, although no less than 100,000 ampules of the vaccine have been issued. He attributes this fact chiefly to the precautions taken to ensure that the culture used for the vaccine is derived from cattle known never to have been in contact with sheep; *Br. melitensis* carried by the latter is highly infectious to man. Santagostino states that in preparing the vaccine the bovine strain should not be passaged through guinea pigs, owing to the possibility of these animals being already infected with *Br. melitensis*.

[70] Oppermann, Th. 1939. *Tierärztl. Rundschau* 45(17): 323-325.

[72] Santagostino, C., 1937. Considerazioni sull'epidemiologia di alcuni casi di febbre ondulante. *Clin. vet., Milano.* 60:139-146. Abst. in *The Vet. Bul.* 9:6, pp. 375-376.

Acetic Acid Therapy in Canker

In treating canker of the hoof, Dethloff [77] proceeds by removing all diseased horn until healthy tissue is reached. The wound area is swabbed with a high-percentage trichloroacetic acid solution. The horseshoe is then replaced, the swabbing with the above solution repeated, and a dressing of plaster of Paris paste is applied. This dressing is changed every three to eight days. Treatment is completed in about three to six weeks. The author is of the opinion that the combined action of the escharotic, the pressure of the bandage, and the exclusion of the air are the curative factors.

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Black Disease in Oregon Sheep

The authors[76] have identified a widespread, heretofore mysterious disease of Oregon sheep as infectious necrotic hepatitis (black disease), caused by an anaërobic bacterium, *Cl. novyi B* (*B. œdematiens*). This disease was first reported from Australia and New Zealand, where it was given the name black disease because the insides of the pelts, when removed, take on a very dark or black appearance. It has been reported also by Montana research workers. Death occurs suddenly in affected sheep, with little or no appearance of a warning sickness. The only symptoms observed have been rapid breathing and a slight rise in temperature. On autopsy, characteristic lesions include: a peculiar, sweetish odor; distension of the pericardial sac with fluid, some of which has coagulated to form a chicken-fat clot; many small hemorrhages under the endocardium, especially under that lining of the left ventricle; liver congested, containing from one to many necrotic areas varying in size to that of a fifty-cent piece, and showing evidence of the presence of immature flukes.

The disease is definitely associated with fluke infestation. The immature fluke burrows into the liver, causing necrotic areas; the bacteria grow on the dead liver tissue, producing a toxin which causes the death of the animal. In the absence of the fluke the bacteria have no suitable site for growth, and the disease does not occur.

Where practical, as where only small areas are involved, the disease may be controlled by treating the pastures with copper sulphate, thus killing the snails which act as intermediate hosts of the liver fluke. Treatment of fluke-infested sheep with carbon tetrachloride is a satisfactory method of destroying the parasites; however, a certain percentage of sheep are susceptible to this drug, dying even from doses too small to kill the parasites; also, if the flukes have already caused necrotic areas in the liver, destroying the parasites will have no effect in checking black disease. Prevention of the disease by the use of vaccines, antitoxins and toxoids is being studied. British workers have reported good results from the use of these agents.

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Hypophysial Cachexia in a Dog

A dog presented for examination [78] exhibited the following clinical symptoms: Severe emaciation complicated by dehydration, tendency toward hypothermy, atrophy of sexual organs, and partial alopecia. The behavior was apathic, but at times there were spells of nervous excitement. In human medicine this symptom complex is known as "Simmond's disease". Treatment with hormone preparations was unsuccessful. The subsequent autopsy confirmed the clinical diagnosis. The hypophysis was nearly twenty times enlarged, and of dark discoloration. Almost all the organs of the endocrine system were atrophied.

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The use of Glover's Mange remedy by dog owners causes many cases of dermatitis in dogs, particularly scrotal dermatitis. They respond promptly to bland lotions or oils.—*C. L. McGinnis.*

[77] Dethloff. Trichloro-acetic acid therapy in canker of the hoof. (Transl. title.) *Tierärztl. Rundschau* 44 (32):524-525.

[76] Shaw, J. N., O. H. Muth, and L. Seghetti. 1939. Black Disease. Ore. Agr. Exp. Sta., Bull. No. 360, March, 1939.

[78] Verstraete, A. and J. Thoonen. *Vlaamsch deergeneesk. tijdschr.* 7(6):186-196.

Book Reviews

25TH ANNIVERSARY SOUVENIR BOOK, Eastern Iowa Veterinary Association, Inc. *Edited by John B. Bryant.* Paper bound. 156 pages, illustrated. Privately printed, Cedar Rapids, Ia., 1939.

If this souvenir book were judged by the standards of book publishers or book writers, inevitably much must needs be criticized. However, the authors ingenuously forestall such criticism by the statement: "Compiled, composed, edited by amateurs between professional calls." That should hold critics—still, it seems they *might* have read proof after calls or sometime.

The effort is a wholly commendable one and the souvenir book will doubtless be a great satisfaction to every member of the Eastern Iowa Veterinary Association, a satisfaction that will grow with the retreat of the events it commemorates. Conventionally, the book deals largely with the history of the association and its members and emphatically is, as Chief Mohler says of it, "essentially a souvenir of service."

The book begins with a dedication "To the foundation of American agricultural wealth—the live stock industry, and to its cornerstone — the veterinary profession." This is followed by 12 pages of congratulatory messages containing a good deal of chaff from prominent veterinarians who have, at one time or another, visited meetings of the E. I. V. A. Following this is a formal history of the 25 meetings of the association and inter-meeting activities, with a briefer record of county and district veterinary associations in Eastern Iowa. Many halftones of members and visitors, biographical sketches of present and deceased members and a few miscellaneous articles of a historical nature complete the volume.

Editor Bryant was assisted in the work of compiling the volume by Iva Dunn, business manager, and Drs. Jerry Wolfe, C. H. Banks, F. J. Crow, O. Q. Mosey, J. H. Spence, R. S. Gerard, and L. W. Kellogg; and unofficially by Dr. Grant B. Munger, "whose unceasing and unselfish efforts entitle him to special mention; an untiring worker to whom the staff owe a debt of gratitude."

The Eastern Iowa Veterinary Association will live longer, prosper more and achieve greater things because of the inspiration of this volume.

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CHRONIC ARTHRITIS IN WILD MAMMALS. *By Herbert Fox,* Professor of Comparative Pathology, University of Pennsylvania; Director, Wm. Pepper Laboratory, Hospital of the University of Pennsylvania. Paper Bound. 148 pages, well illustrated. American Philosophical Society, Philadelphia, 1939. Distributed by: University of Pennsylvania Press, 3622 Locust St., Philadelphia. $2.00.

This work is an exhibition of amazing patience. The author examined in detail every bone of 1749 skeletons of caged or wild animals. It is a work that, of course, those veterinarians having any practice with caged animals will want to possess because of the paucity of scientific discussions dealing with the pathology of such animals.

Nor is it without interest to all veterinarians. Arthritis, or rheumatism as it is called, is one of the principal incapacitating ailments of man and under the name of osteomalacia, degenerative arthritis, etc., is responsible for more incapacity of horses and greater economic loss to the owners of horses than any other ailment.

In the 1749 skeletons examined, the author classed 77 of them as definitely arthritic. This shows at once the relative rarity of this condition in wild and caged animals as compared with its prevalence in man and domestic animals. He found it commonest in the anthropoid ape, cat, hyena, bear, buffalo and deer in the order named, and did not find it at all in Canidæ, rodent or bat.

He found a definite relation between arthritis and work. Thus, in the main, it was a disease of large animals and in them commonest in joints subjected to the greatest stress. There was correlation with age also, all cases occurring in animals at least mature, if not aged. There was no relationship to ecology, individual habits, diet or focal infection.

A PRACTICAL CAT BOOK. *By Ida M. Mellen.* Cloth bound. 230 pages, 60 illustrations. Charles Scribner's Sons, New York, 1939.

According to the publisher, this book is written for everyone who owns a cat and desires to understand it better and give it the most intelligent care. He claims that it is the only book that covers all cat breeds found in the United States.

The author has spent a total of 24 years studying and raising cats, and out of this practical experience has written this book.

The chapters on feeding and on parasites and disease contain all the traditional superstitions and misinformation common to the cat fancy, along with many sensible suggestions based no doubt upon the author's extensive experience and observation.

There is a selected bibliography of about 75 titles, including a list of 12 best cat books for children, and a complete cross-index.

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MEDICAL ENTOMOLOGY with special reference to the health and well-being of man and animals. *By William B. Herms,* Professor of Parasitology in the University of California, Consulting Entomologist for the California State Board of Health, Honorary Member National Malaria Committee, 3rd Edition. Cloth bound. 582 pages, over 200 illustrations and tables. The MacMillan Company, New York, 1939. $5.50.

In recent years such great strides have been made in the study of arthropods as vectors of diseases of both man and beast that this present edition of "Medical Entomology" is a complete revision of the previous book, "Medical and Veterinary Entomology," with some chapters entirely rewritten. The experimental method is stressed throughout and the public health aspects have been measurably strengthened to keep pace with the increasing interest in the public health.

It deals with every type of insect, worm and spider dangerous to animals, either as carriers of disease or as parasites; giving detailed information on the characteristics and life habits of insects, on means of destroying them, and on the symptoms of the diseases they cause. There are particularly useful chapters on mites, ticks and horseflies.

Noted Veterinary Research Scientist Dies

The recent death of Cooper Curtice, D. V. S., M. D., at the age of 83, brings to a close the life of one of the most illustrious of veterinarians. He was the last surviving member of the famous trio Kilborne, Smith and Curtice, who attained worldwide renown in scientific circles by discovering the mode of transmission of tick fever of cattle. In 1889 Curtice had worked out the life history of the tick on which not only the discovery was based but the subsequent tick eradication program was builded so soundly that almost without change it has been successfully carried out until the end—the eradication of every cattle tick from continental United States—is in sight. Its worth to the cattle industry of the South and to all who consume the products of cattle is beyond calculation.

Doctor Curtice retired from the Bureau of Animal Industry in 1930 after almost a half-century of distinguished service in that institution. As early as 1886 he made important additions to the knowledge of tapeworms of cattle and in 1888 discovered the cause of nodular disease in sheep. Goose septicemia, blackhead in turkeys, stomach worms in sheep and tuberculosis eradication also came under his fruitful investigation. The last five years of his active official career were spent at McNeill, Miss., investigating various methods for the control of parasites of sheep.

During leaves of absence from the federal service, which began in 1883, Doctor Curtice served as veterinarian for the state board of health of New York (1893-4 and 1897-8), State Veterinarian of North Carolina (1898-1900) and animal husbandman at the Rhode Island agricultural college (1900-06). At the Chicago meeting of the A. V. M. A. in 1933 he was awarded a medal and presented with a citation for his part in the tick fever discovery.

Doctor Curtice died August 8 at Beltsville, Md., to which he had removed only a few months ago. He is survived by his widow and seven children.